EXHIBIT 1

REDACTED

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

IN RE GOOGLE PLAY STORE ANTITRUST LITIGATION THIS DOCUMENT RELATES TO: *In re Google Play Consumer Antitrust Litigation*, Case No. 3:20-cv-05761-JD	No. 3:21-md-02981-JD **CLASS CERTIFICATION REPORT OF HAL J. SINGER, PH.D.** Judge: Hon. James Donato

HIGHLY CONFIDENTIAL UNDER PROTECTIVE ORDER

INTRODUCTION

1. Google Play (the "Play Store"), owned and operated by Google,[1] is the largest distributor of Android-compatible software applications for mobile devices ("Apps") and the only store that can reach virtually every Android mobile user outside of China. With some exceptions, Google generally takes 30 percent of all revenues on the original sale and downloading of Apps from the Play Store and the sale of digital content within Apps ("In-App Content").[2] Counsel for Mary Carr, Daniel Egerter, Zack Palmer, Serina Moglia, Matthew Atkinson, and Alex Iwamoto, on behalf of themselves and all others similarly situated (the "Consumer Plaintiffs" or "Class"), have asked me to assess the competitive effects of the various restrictions Google enforces (collectively, the "Challenged Conduct"), to extract these "take rates,"[3] and, in particular, to assess whether, as a result of the Challenged Conduct, consumers have overpaid for the initial downloads of Apps through the Play Store and for purchases of In-App Content.

2. In this report, I rely on common economic evidence and methods for my preliminary conclusions herein. Common economic evidence and methods confirm that Google has monopoly power in the market for the sale and distribution of Apps for Android mobile devices (the "Android App Distribution Market") and that it has gained and maintained such power through the imposition of exclusionary contractual provisions and artificial technological barriers that unnecessarily impede the distribution of applications outside of the Play Store. Similarly common economic evidence and methods show that Google has extended its power in the Android App Distribution Market into the ancillary aftermarket for services in support of consummating purchases of In-App Content (the "In-App Aftermarket"). I determine that Google has gained and maintained significant market power in the In-App Aftermarket through anticompetitive, exclusionary contractual restrictions (the "Aftermarket Restrictions") that function as an economic tie-in of Google's Android App Distribution Market services to the In-App Aftermarket. In the event that the factfinder concludes that the Android App Distribution Market and In-App Aftermarket are not two separate markets, I present alternative models that can be applied to a single, combined market, again using common economic evidence and methods. I further conclude that, in the absence of Google's anticompetitive conduct, the Consumer Plaintiffs would have paid lower prices for both Apps and In-App Content, and would also have benefitted from enhancements to output, quality, and consumer choice. This conclusion holds regardless of whether there are two relevant markets or just one.

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1. Google includes Google, LLC, Google Ireland Ltd., Google Commerce Ltd., Google Asia Pacific Pte. Ltd., and Google Payment Corp.

2. As shown in Tables 3 and 5, *infra*, Google's average take rate across all transactions on the Play Store during the Class Period (August 16, 2016 through December 31, 2020) exceeds [redacted] for both initial downloads and In-App Content. The reason why [redacted] While Google's online policies have changed over time, In-App Content as used in this report is consistent with what Google refers to as "in-app purchases." Google's current policy states: "Play-distributed apps requiring or accepting payment for access to in-app features or services, including any app functionality, digital content or goods (collectively "in-app purchases"), must use Google Play's billing system for those transactions" subject to discrete exceptions. *See* Play Console Help, *available at* https://support.google.com/googleplay/android-developer/answer/9858738.

3. To describe its price to developers, Google uses the terminology "revenue share," which reflects the fact that Google is taking a piece of the developers' revenues, injecting itself as a "partner" in the customer-developer relationship. Google also uses the term "revenue share" to refer to the portion of the take rate Google has shared with mobile carriers and original equipment manufacturers. For ease of exposition, I use the term "take rate" to capture Google's price charged to developers.

QUALIFICATIONS

3. I am a managing director at Econ One, an economic consulting firm, and an adjunct professor at the McDonough School of Business at Georgetown University, where I teach advanced pricing to MBA candidates. A copy of my CV, including a list of my expert testimony since 2012, is attached to this report as Appendix 1.

4. I am an applied microeconomist with an emphasis on industrial organization and regulation. In an academic capacity, I have published several books and book chapters spanning a range of industries and topics, and my articles have appeared in dozens of legal and economic journals. My competition-related articles have appeared in multiple American Bar Association (ABA) Antitrust Section journals, and I have been a panelist at several ABA Antitrust Section events. In a consulting capacity, the American Antitrust Institute (AAI) nominated me for antitrust practitioner of the year in 2013 in the economist category for my work in *Tennis Channel v. Comcast*, and the AAI named me as co-Honoree in the same category in 2018 for my work *In Re Lidoderm Antitrust Litigation*.

5. I have testified as an economic expert in state and federal courts, as well as before regulatory agencies. Federal courts have certified multiple classes in reliance on my economic testimony on antitrust impact and damages.[4] I also have testified many times before Congress on competition policy, most recently at a February 2021 hearing titled "Reviving Competition, Part 1: Proposals to Address Gatekeeper Power and Lower Barriers to Entry Online," held by the House Subcommittee on Antitrust; and at a February 2022 hearing titled "Breaking the News – Journalism, Competition, and the Effects of Market Power on a Free Press," held by the Senate Subcommittee on Competition Policy, Antitrust, and Consumer Rights. Finally, I have served as an antitrust expert to Competition Bureau Canada and to several state Attorneys General.

6. Econ One Research is being compensated for my work in this matter at my standard hourly rate of $885. My compensation does not depend on the outcome of this litigation.

7. The materials I relied upon in forming my opinions are noted in the footnotes throughout this report or otherwise listed in Appendix 2. I provide this report to assist in evaluating the suitability of the case for class certification. As discovery is ongoing, I reserve the right to supplement, expand, or amend my opinions.

BACKGROUND

8. Mobile devices, and smartphones in particular, have become ubiquitous in daily life, essential providers of communication, entertainment, and information. These hand-held

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4. *See Meijer, Inc. v. Abbott Laboratories*, No. C 07-5985 CW, 2008 WL 4065839 (N.D. Cal. Aug. 27, 2008) (order granting plaintiffs' motion for class certification); *Natchitoches Parish Hosp. Serv. Dist. v. Tyco Intl., Ltd.*, 262 F.R.D. 58 (D. Mass. 2008) (granting motion to certify class); *In re Delta/AirTran Baggage Fee Antitrust Litig.,* 317 F.R.D. 665 (N.D. Ga. 2016) (same); *Johnson v. Arizona Hosp. and Healthcare Assoc.* No. CV 07-1292-PHX-SRB, 2009 WL 5031334 (D. Ariz. July 14, 2009) (granting in part motion for class certification); *Southeast Missouri Hospital and St. Francis Medical Center v. C.R. Bard*, No. 1:07cv0031 TCM, 2008 WL 4372741 (E.D. Mo. Sept. 22, 2008) (granting in part and denying in part motion for class certification); and *In re Lidoderm Antitrust Litig.*, No. 12-md-02521, 2017 WL 679367 (N.D. Cal. Feb. 21, 2017) (order granting motions for class certifications and denying Daubert motions); *Cung Le et al. v. Zuffa, LLC d/b/a Ultimate Fighting Championship,* Minute Entry, 2:15-cv-01045-RFB-BNW (D. Nev. Dec. 10, 2020), ECF No. 781 (announcing the court's intention to grant the plaintiffs' motion for class certification). As of the time of this report, the court has not issued the written opinion.

portable computers can be used almost anywhere, allowing us to connect to the internet from any location that offers the requisite cellular or wi-fi network. Whether you want to buy stock in GameStop, check the score of the San Francisco 49ers game, or call your mother—mobile devices do it all.

9. Like the mini-computers they are, mobile devices are comprised of both hardware and software. The hardware typically consists of an LCD or OLED flat screen and some combination of physical buttons, digital keypads, and, ever more frequently, a touchscreen interface.[5] As with computers, mobile devices are controlled by an operating system ("OS"), software that manages the device's hardware and software resources. But the real work—and play—on mobile devices is performed by consumer "applications" or more commonly "apps," software programs designed to perform a myriad of functions. Apps are typically displayed on the device screen through a representative image, known as an icon, and can be called by the user through a touch, a tap, or the click of a button.

10. Mobile device operating systems dictate how an app must be developed to function on the device. However, operating systems are not cross-compatible; an app designed to run on one operating system must be substantially re-written to function on a separate, distinct operating system.[6] Prior to the launch of Android mobile devices, individual cellular carriers and original equipment manufacturers ("OEMs") controlled the industry, providing not only the hardware for mobile devices, but also writing most of the software for their own devices.

11. Today, the only two major mobile device operating systems globally (excluding China) are Apple's iOS and Android.[7] Apple is the exclusive hardware producer of its popular iPhone (smartphone) and iPad (tablet) devices, which are powered by Apple's proprietary iOS operating system. Unlike iOS, the Android operating system is allegedly "open source," meaning that anyone can inspect, modify, or enhance the source code to manipulate the software. While an open-source version of Android exists, the vast majority of OEMs manufacture Android OS devices that meet Google's compatibility requirements and are preloaded with a proprietary suite of apps and interfaces that Google designed specifically for mobile devices ("Google Mobile

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5. *See* IGI Global, *What is Mobile Devices*, *available at* www.igi-global.com/dictionary/use-of-apps-and-devices-for-fostering-mobile-learning-of-literacy-practices/18837 ("A mobile device is a computing device small enough to hold and operate in the hand. Typically, any handheld computer device will have an LCD or OLED flat screen interface, providing a touchscreen interface with digital buttons and keyboard or physical buttons along with a physical keyboard.").

6. *See* Lionel Valdellon, *What Are the Different Types of Mobile Apps? And How Do You Choose?*, CLEVERTAP, (Nov. 1, 2020), *available at* clevertap.com/blog/types-of-mobile-apps/("Native apps are built specifically for a mobile device's operating system (OS). […] [T]he problem with native apps lies in the fact that if you start developing them, you have to duplicate efforts for each of the different platforms. The code you create for one platform cannot be reused on another. This drives up costs. Not to mention the effort needed to maintain and update the codebase for each version."). *See also* Jason Turnquist, *How Much Does App Development Cost?*, FYRESITE, (July 31, 2020), *available at* www.fyresite.com/how-much-does-app-development-cost/ (Detailing how Uber might seem like one app, but is in reality four apps: "a native iOS app for drivers, a native Android app for drivers, a native iOS app for riders, and a native android app for riders," where each new permission [app] created increases the price to develop it.).

7. *See, e.g.,* Sherisse Pham, *Google now has two apps in China, but search remains off limits*, CNN BUSINESS, (May 31, 2018), *available at* money.cnn.com/2018/05/31/technology/google-in-china-files-app/index.html ("The company's own app store, Google Play, remains blocked in China[.]").

Services" or "GMS").[8] For purposes of this report, I refer to devices that are pre-loaded with the GMS suite of apps as ("Google Android"); these devices make up over 70 percent of all mobile devices in the global market.[9] Collectively, Google's Android and Apple's iOS make up 99 percent of mobile devices worldwide.[10]

12. The functionality and user enjoyment derived from a mobile device is highly dependent upon the range and quality of apps available on it. In addition to producing a mobile operating system, Google has created a distribution channel for delivery of Android-compatible apps developed by third parties, and developed its own universe of Apps, for Google Android. Google itself has developed some of the most popular Android- and iOS-compatible apps, including Google Search, Google Maps, Chrome, YouTube, and Gmail.

13. When purchased by the consumer, mobile devices come pre-loaded with a variety of apps pre-positioned on the device's "home screens," each of which is accessed by swiping your thumb. The first screen is known as the "default home screen." Because pre-loaded apps—whether on the home screen or otherwise—are automatically available to all the users who purchase the device, app developers would find it advantageous to have their apps pre-installed by the OEMs (though, as detailed below, preinstallation is not an option for the majority of developers).[11] Similarly, the placement of an app in a prominent place on a device's home screen makes it more likely that consumers will open and engage with the app, meaning the initial icon placement can strongly influence an app's overall usage and popularity.[12] Pre-installation and default placement of pre-loaded apps are significant factors in determining an app's adoption by consumers and the app's ultimate success.

14. In addition to proprietary Apple and Google apps, independent software developers create and code a broad universe of apps for both operating systems. However, the Android and Apple operating systems are not compatible, meaning that software developers must create independent versions of their apps to operate on each system. For the vast majority of developers, expending the time and resources necessary to create an app for a particular operating system depends upon the number of consumers using a device running that operating system. Given the reach of Google Android and Apple iOS devices, most large developers currently create and provide apps for both systems.

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8. Android, *The best of Google, right on your devices*, *available at* www.android.com/gms/ ("Google Mobile Services (GMS) is a collection of Google applications and APIs that help support functionality across devices.").

9. Statista, *Mobile operating systems' market share worldwide from January 2012 to June 2021, available at* www.statista.com/statistics/272698/global-market-share-held-by-mobile-operating-systems-since-2009/ [hereafter *Statista Mobile OS Shares*]. These data include China. For the purposes of the relevant markets here, however, I exclude China because, by government decree, Apps downloaded there cannot be supported by the Play Store.

10. *Id*. It bears noting that Android and Apple jointly dominate the marketplace for mobile operating systems in China as well. *See* Statista, *Market share of mobile operating systems in China from January 2013 to March 2021*, *available at* www.statista.com/statistics/262176/market-share-held-by-mobile-operating-systems-in-china/ (showing Android and Apple accounting for over two thirds and one fifth of the Chinese mobile operating market, respectively).

11. *See, e.g.,* GOOG-PLAY-010801568 at GOOG-PLAY-010801570 [redacted] presentation noting that [redacted]; GOOG-PLAY-001404176 ([redacted]).

12. *See, e.g.,* GOOG-PLAY-006355073 ([redacted]).

15. At the level of mobile devices running an operating system, Google Android devices, manufactured by OEMs such as Samsung, and Apple devices compete with one another for users.[13] However, once a consumer has elected to purchase a mobile device using either Google Android or Apple iOS, they are effectively locked-in to that ecosystem for that device. Because the two ecosystems are incompatible, paid apps cannot be transferred by a user from one system to another.[14] The user interfaces for an Apple iOS device and a Google Android device function differently, requiring significant expenditures of time and effort by users to learn and master. Users also invest money and time in identifying, buying and/or installing apps and content, including games, music, and videos, that may have to be repurchased or reinstalled upon switching operating systems. As a result of these factors, economic analysis and application of standard economic tests for market definition show that the market for Android apps and for the distribution of those apps is distinct and separate from the market for app distribution on Apple's proprietary iOS.

16. Google is the pioneering creator of the Google search engine. Google's business strategy has focused on providing free software and digital services,[15] which in turn generated information about users, ranging from personal identifying information like email and billing addresses, to areas of interest, to discrete preferences in products and services. Google does not sell its raw user information,[16] choosing instead to monetize this information via its vast advertising business. Google provides advertising inventory including space on its Google Search result pages and its YouTube video platform. It also provides tools used by both advertisers and online publishers in the purchase and sale of digital display advertising. Google's vast trove of user information, gathered across its range of free software products, including the Play Store, enhances the value of all Google advertising products.[17]

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13. The competition does not extend to all users. Most Android phones are at a price point below the cheapest iPhone. And most Android users outside the U.S. could not afford an iPhone even if they wanted it. Given its wealth, the United States is an outlier in this respect.

14. Apple cannot guarantee even that all free apps will be ported. *See* Apple, *Move from Android to iPhone, iPad or iPod touch*, *available at* support.apple.com/en-gb/HT201196 ("Here's what gets transferred: contacts, message history, camera photos and videos, photo albums, files and folders, accessibility settings, display settings, web bookmarks, email accounts and calendars. If they're available on both Google Play and the App Store, *some of your free apps* will also be transferred. After the transfer is complete, you can download any free apps that were matched from the App Store.") (emphasis added). Likewise, Google's own Pixel switching service cannot transfer paid apps from iOS. *See* GOOG-PLAY-004147888 at GOOG-PLAY-004147897; Pixel Phone Help, *Transfer Data from an iPhone to a Pixel, available at* support.google.com/pixelphone/answer/7129740#what_doesnt_copy&zippy=%2Cwhat-wont-copy-during-setup ("What won't copy during setup" includes "Paid apps" and "Unpaid apps not matched on the Play Store").

15. 2004 Founder's IPO Letter, From the S-1 Registration Statement, *available at* abc.xyz/investor/founders-letters/2004-ipo-letter/.

16. Google Safety Center, *Ads That Respect Your Privacy*, *available at* safety.google/privacy/ads-and-data/ ("We never sell your personal information.").

17. *See, e.g.*, Megan Graham & Jennifer Elias, *How Google's $150 billion advertising business works*, CNBC, (May 18, 2021), *available at* www.cnbc.com/2021/05/18/how-does-google-make-money-advertising-business-breakdown-.html. *See also* Competition & Markets Authority, *Online platforms and digital advertising: Market study final report*, (July 1, 2020), 1-437, 228, *available at* assets.publishing.service.gov.uk/media/5fa557668fa8f5788db46efc/Final_report_Digital_ALT_TEXT.pdf ("Google has tags (including as a third-party) on over 80% of websites and over 85% of apps on the Play Store, which allows it to form a more complete picture of users' ad exposures, across its own properties and a substantial proportion of other non-Google websites.").

17. In Google's earliest years, over 99 percent of its revenues were generated by its advertising business[18] and, in 2020, Google continued to generate over 80 percent of its total revenues from advertising.[19] Google's development of the Android operating system for mobile devices complements its advertising business because Google collects information about users, their devices, and their interactions with apps every time an app is installed or updated on a Google Android device.[20] In addition, as consumers started to spend more time on mobile devices as compared to laptops and PCs, Google needed to ensure that Google's services reached mobile device users in order to collect user data. Accordingly, Google invested in Google Android so that these consumers would use its proprietary GMS suite of apps and interfaces.[21] Consumers' use of these services provided similarly valuable user data from mobile devices as that provided by Google's proprietary software on PCs and laptops.

OVERVIEW OF ANALYSIS

18. Google Android has attained a share of over 99 percent of the market for licensed mobile device operating systems.[22] For OEMs that have manufactured mobile devices, Google Android is the licensed operating system of choice. These OEMs cannot install Apple's iOS on their mobile devices because Apple refuses to license its operating system, preferring to manufacture its own devices. And since apps are neither interoperable nor transferable across the Android and iOS systems, there exist distinct markets for app distribution within each of the two operating systems. Thus, once a consumer has selected the Google Android mobile device ecosystem through the purchase of an initial device, the consumer is "locked-in" to the Google Android ecosystem, and Apple does not meaningfully constrain Google's pricing for the distribution of Android Apps.[23]

19. To pre-install the Google Mobile Services ("GMS") suite of Apps and interfaces on their own devices, OEMs must enter into a licensing agreement with Google. The Play Store, formerly known as Android Marketplace, is part of Google Mobile Services and is an "app store" that provides consumers with a range of Apps they can download and use on their Android devices. An app store is a two-sided platform: on one side, developers offer apps for download and purchase, while on the other side, consumers search for and purchase apps to download to their devices. Such two-sided platforms are characterized by what economists call "indirect network effects," meaning that the value of the platform to the users on one side is increased when there are more users on the other side of the platform. Here, the value of an app store to consumers is increased when more developers offer more apps on the platform. In turn, the value of an app store to developers is increased when there are more consumers utilizing the store to search for and

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18. Google SEC Form 10-K, for the fiscal year ended Dec. 31, 2007, at 39, *available at* www.sec.gov/Archives/edgar/data/1288776/000119312508032690/d10k.htm.

19. Google SEC Form 10-K, for the fiscal year ended Dec. 31, 2020, at 10, *available at* www.sec.gov/Archives/edgar/data/1652044/000165204421000010/goog-20201231.htm.

20. Google Privacy & Terms, *Google Privacy Policy*, available at policies.google.com/privacy?hl=en-US.

21. Android, *The best of Google, right on your devices*, *available at* www.android.com/gms/ ("Google Mobile Services (GMS) is a collection of Google applications and APIs that help support functionality across devices.").

22. *See* Statcounter, *Mobile Operating System Market Share Worldwide*, (accessed Feb. 2022), available at gs.statcounter.com/os-market-share/mobile/worldwide/#yearly-2019-2019-bar (Android and iOS shares at 69.74% and 29.49%, respectively, as of February 2022); *Statista Mobile OS Shares* (Android and iOS shares at 72.84% and 26.34%, respectively, as of June 2021).

23. Although consumers can switch to different ecosystem when purchasing a new phone, competition in that dimension is insufficient to constrain Google from imposing anticompetitive take rates on developers.

download apps. Indeed, Google's internal documents and depositions taken to date reveal that [redacted]—is a critically important factor in the Play Store's attractiveness to developers.[24]

20. In October 2008, when Google launched its Android app store, Google's primary goal was to ensure adoption of Google Android by the array of OEMs and cellular carriers that previously provided their own branded devices with differentiated software and operating systems[25]—and by extension, by consumers choosing Android devices over Apple and Blackberry devices. [redacted]

21. Accordingly, while Google has consistently allowed Android App developers to keep 70 percent of the proceeds of all App sales and the sale of In-App Content, the distribution of the remaining 30 percent has changed over time. As shown in Figure 1 below, Google originally retained, at most, [redacted][26] as an incentive to entrench the Play Store on more mobile devices and to discourage the initiation and success of competing app stores. Google's witnesses have testified [redacted] not to compete in the Android App [redacted]

24. GOOG-PLAY-007317611 at GOOG-PLAY-007317614 and GOOG-PLAY-007317615 (Report of Dr. Itamar Simonson, Feb. 8, 2016) ([redacted]). *See also* Deposition of Lawrence Koh (Dec. 9, 2021) [hereafter Koh Dep.] at 321:19-323:1; 324:6-12 ([redacted]).

25. *See* Part III.D.2, *infra*.

26. [redacted] GOOG-PLAY-007847148 (Deposition of Jamie Rosenberg (July 14, 2020) in *In re Google Antitrust Litigation*) [hereafter Rosenberg Dep.] at 126:10-129:9.

27. Deposition of Eric Chu (Dec. 20, 2021) [hereafter Chu Dep.] at 84:10-88:7 [redacted]).

The Android App Distribution Market

22. The Play Store is Google's two-sided platform for bringing together developers and consumers, allowing developers to sell and distribute Android-compatible Apps and consumers to purchase Apps for use on their Android devices. In addition to providing matchmaking between consumers and developers, other functions in the Android App Distribution Market include but are not limited to auto-updating and storage.[28] With the exception of China, where the Play Store is blocked,[29] "Apple and Google control more than 95 percent of the app store market share through iOS and Android…The app economy was built on these two platforms[.]"[30] Due in part to the massive installed base of Android mobile devices, the Play Store accounts for more than

28. The take rate compensates Google for all of these functions. There is no separate demand among consumers or developers for any of these functions.

29. VPNDada, *How to Access Google Play Store in China*, *available at* www.vpndada.com/access-google-play-store-china/ ("If you buy an Android phone in China today, you won't find the Google Play app store pre-installed on that phone. Instead, depending on the brand of the phone, it will come with some other app stores, mostly likely one offered by a Chinese company.").

30. David Curry, *App Store Data (2022), Business of Apps*, (Jan. 11, 2022), *available at* www.businessofapps.com/data/app-stores/ ("Outside of China, Apple and Google control more than 95 percent of the app store market share through iOS and Android, respectively…The app economy was built on these two platforms, which have expanded their offerings to include apps for consumers and every type of business."). *See also* Part II.C.2.

three times as many downloads as the Apple App Store worldwide—despite the Play Store's absence from China.[31]

23. The Android App Distribution Market is a relevant product market that is distinct not only from Apple's iOS app distribution market, but also from the markets for web-based apps and distribution channels for applications for PCs or gaming consoles. Given the widespread distribution of the Play Store throughout the world, developers of Android-compatible Apps, wherever they are located, have strong incentives to list their Apps for distribution on the Play Store. The global reach of the Play Store and the developers who seek to distribute their Apps through it thus makes the relevant geographic market for the Android App Distribution Market global, excepting China, where the government prefers Chinese providers of both mobile devices and operating systems.[32]

24. Direct and indirect evidence establishes that Google has market power in the Android App Distribution Market. Google's 30 percent take rate is high relative to competitive benchmarks, yet the vast majority of apps are downloaded through the Play Store. As a two-sided platform, the Play Store benefits from indirect network effects, which serve to entrench its market share with developers. Given Google's reach with consumers gained and maintained through the restrictions, and the anticompetitive conduct that has substantially foreclosed alternative channels for Android-compatible Apps, developers effectively must list their Apps on the Play Store and agree to its restrictive conditions, which in turn act as substantial barriers to entry for effective competition from rival app stores.

25. Google has provided inducements, imposed a variety of restrictions, and erected various technological barriers to substantially foreclose rival app stores and the direct downloading of Apps. It has done so to achieve and maintain its market power in the Android App Distribution Market. More specifically, Google has engaged in the following conduct in the Android App Distribution Market:

a. *Financial Inducements*: Google achieved its power in the Android App Distribution Market by making payments that incentivized carriers (and OEMs) to distribute Google Android mobile devices and dissuaded (and in some cases prevented) them from developing, promoting, or offering alternative app stores, including their own stores. Google was willing to operate the Play Store at a loss to achieve these purposes but, once power was achieved, Google dramatically reduced or eliminated these payments.

b. *Bundling of Apps and APIs*: Google requires OEMs to pre-install and prominently place the Play Store on all Google Android devices as a contractual

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31. *See, e.g.,* Sensor Tower, *2021 – 2025 Mobile Market Forecast,* (2021) at 7, *available at* go.sensortower.com/rs/351-RWH-315/images/Sensor-Tower-2021-2025-Market-Forecast.pdf (showing 109 billion Play Store app downloads worldwide in 2020, compared with 34 billion app downloads in the Apple App Store). Industry data show that the Play Store also accounts for approximately 90 percent of non-Apple, non-China mobile device app expenditures worldwide *See* Part II.C.2 for derivation.

32. GOOG-PLAY-004253884 at GOOG-PLAY-004253894 ([redacted]). It bears noting that all references to "global" markets or the use of the terms "globally" or "world" in this report assume that China is excluded.

condition of licensing GMS, which includes Google's most popular Apps, including Google Maps, YouTube, Chrome, Google Search, and Gmail. OEMs must also install this bundle of apps to gain access to crucial programming interfaces necessary for many common android apps to properly function. The Play Store's prominent position inhibits competition from competing app stores.

c. *Anti-steering Restrictions*: Google's agreements with App developers prohibit developers from steering users within the App to other app stores, platforms, or websites to purchase or download Apps.

d. *Tie of YouTube, Google Search and Play Store Advertising to the Play Store*: App developers' access to valuable advertising opportunities on YouTube and Google Search is conditioned on the sale and distribution of developers' Apps through the Play Store.

e. *Technical Barriers*: Google imposes default settings and warnings that make it unnecessarily difficult for users to download rival app stores and Apps from rival app stores or from developer websites, and Google limits auto-updating functionality to the Play Store and certain pre-installed Apps.

26. These restraints inhibit the development of alternative competing app stores and the use of direct downloads from developers' websites to install apps on Google Android devices. Multi-homing, the use of alternative app stores on the same device, would occur more extensively in the absence of Google's restraints. In a competitive world, steering via altering the relative price of initial downloads of Apps would allow developers to direct consumers to lower-priced alternatives, including direct downloads from their own websites or competing app stores that charge lower take rates. With a combination of multi-homing and steering, developers could charge a relatively lower price for Apps to consumers who download Apps from a lower-cost app platform or website. This would in turn exert competitive pressure on Google to lower its own take rate.

The Aftermarket for Services in Support of Consummating Purchases of In-App Content

27. Following the download and installation of an App, developers may continue to offer digital content to the consumer related to the App. The matchmaking services offered in Android App Distribution Market are distinct from those services offered in support of consummating purchases of In-App Content. Unlike the two-sided nature of the Android App Distribution Market, the In-App Aftermarket is one-sided: It is a simple transaction between a buyer (the developer) and a seller of services, including payment processing, record keeping, and unlocking of content, needed to consummate a purchase of In-App Content. In economic parlance, indirect network effects are not present in the In-App Aftermarket. From the developer's perspective, certain functions are needed for a consumer to be able to purchase In-App Content, including billing (also present in the Android App Distribution Market) and unlocking the In-App Content on the user's phone (not present in the Android App Distribution Market). The developer's demand for these services in the In-App Aftermarket is derived from the demand by the consumer for the In-App Content itself. While the App developer delivers the In-App Content, because of Google's requirements, an App developer cannot complete the transaction without using Google's services, mainly Google Play Billing. By forcing developers to complete transactions through

Google's payment and unlocking system, Google Play Billing, Google has effectively tied the In-App Aftermarket to the Android App Distribution Market and forced developers who distribute an App to a consumer through Google to forever use Google as a middleman for the consumers' purchase of In-App Content by virtue of its Google Play Billing requirements.[33] Absent this tie-in, developers could either provide or engage third parties to provide the services in the In-App Aftermarket, now provided by Google.

28. Once an App is purchased and downloaded from the Play Store, the Play Store need not play any role in the In-App Aftermarket. Through the Android App Distribution Market, the platform has brought the developer and the consumer together and facilitated the download and installation of the App on the device. I understand that Plaintiffs' technical expert, Professor Douglas Schmidt, has found that, although Google inserts itself into the In-App Aftermarket by requiring that developers use Google Play Billing, there is no technical justification for requiring developers to use Google Play Billing. Similarly, while Google requires that every App downloaded through the Play Store utilize the services that Google has included in its Google Play Billing product for the sale of In-App Content, there are numerous alternatives that can provide similar features at a lower cost to developers, and ultimately consumers.

29. Google maintains market power in the In-App Aftermarket by requiring developers to use Google Play Billing to support the purchase of all In-App Content. Google utilizes Google Play Billing to impose a take rate generally of 30 percent—the same take rate it commands in the Android App Distribution Market—on all purchases of In-App Content, forever. The In-App Aftermarket is a distinct relevant market, and in the but-for world, developers could select many potential competitors to support the purchase of In-App Content. This is evidenced by Google's prohibition on developer steering of consumers to outside channels, the ability of more powerful developers to bypass Google Play Billing, and Google's efforts to incentivize these developers to transact through Google Play Billing. The geographic In-App Aftermarket is global, except for China, as third party In-App Aftermarket service providers could provide cross-border global services.

30. Direct and indirect evidence establish Google's market power in the In-App Aftermarket. Google's standard 30 percent take rate is high compared to rates charged by potential competitors, yet [redacted] of all developers offering In-App Content utilize Google Play Billing by virtue of Google's restraint.[34] Moreover, Google routinely discriminates in price among developers, not requiring those selling in-app physical goods to utilize Google Play Billing, and, more recently, reducing its take rate on subscription sales or sales by smaller developers, reflecting

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33. Once a payment is consummated, the In-App Content is either unlocked within the App itself or accessed and downloaded by the App from an independent server. In addition to payment processing, other services currently performed by Google in the In-App Aftermarket (by virtue of its exclusionary restrictions) include record keeping, server hosting, and security.

34. Record evidence indicates Google recognized [redacted] *See, e.g.*, GOOG-PLAY-004338990 (Internal December 2009 e-mail seeking [redacted]).

the fact that Google faces a downward-sloping demand curve among developers, a hallmark of market power.[35]

31. Google has maintained its market power in the In-App Aftermarket by imposing a variety of restrictions and offering targeted financial incentives. More specifically, Google has engaged in the following conduct in the In-App Aftermarket:

a. *Linking Play Store Access*: A developer can offer its App for sale or distribution through the Play Store—a monopolist in the Android App Distribution Market—only if the developer agrees to exclusively use Google's in-app system, Google Play Billing, for all subsequent sales of In-App Content.

b. *Anti-Steering Restrictions*: Google contractually prohibits developers from steering customers within the App to alternative distribution and payment processing outlets for purchasing In-App Content outside the Play Store and prohibits them from even using any customer information the developer learned through the Play Store.

c. *Targeted Incentives*: Google provides [redacted] to ensure compliance by those developers that have the resources to create alternative app stores or billing systems.

32. For ease of exposition, I refer to this collection of restraints as the "Aftermarket Restrictions," and I refer to the first restriction (a) in particular as the "Aftermarket Tie-in" or "Tie-in."[36] In the absence of the Aftermarket Restrictions, competition in the In-App Aftermarket would be robust. Developers would be able to select their own suppliers, or they would offer consumers the option of selecting a payment processing system, as well as other features (e.g., record keeping, server hosting, and security) provided in the In-App Aftermarket, from an array of competitive options and could steer consumers towards lower-priced alternatives.

The Impact of Google's Anticompetitive Conduct on the Class of Consumer Plaintiffs

33. Google's anticompetitive restrictions in the Android App Distribution Market and in the In-App Aftermarket have impaired competition in both markets. These anticompetitive restrictions have damaged the Consumer Plaintiffs by raising the prices of paid Apps and In-App Content for all or nearly all members of the class of Consumer Plaintiffs (the "Class"). Absent Google's restrictions and anticompetitive conduct, competition in the distribution of applications would materialize, and developers would likewise have a choice of how to transact their In-App Content with their own users. The benefits to consumers resulting from competition could take different forms. I use a two-sided platform model with multi-homing to show that, in the absence of restraints in the Android App Distribution Market, Google would be compelled to lower its take rate from developers. I show that a portion of the savings to developers from a take rate reduction

35. Firms that lack market power, by contrast, face a horizontal demand curve, which means they cannot restrict output by raising prices.

36. Although the last item c can also be understood as an incentive, when employed by a firm with monopoly power, a loyalty rebate or bundled loyalty discount can foreclose rivals and thereby serve as a restraint on trade. *See, e.g.*, Patrick Greenlee, David Reitman, and David S. Sibley, *An antitrust analysis of bundled loyalty discounts*, 26 INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION 1132-1152, 1132, 1135, 1137-38 (2007).

would be reflected in lower consumer prices. Next, I show that Google would have responded to greater distribution competition by increasing consumer subsidies through, for example, its Play Points Program.[37] Consumers would obtain the benefits of these subsidies directly from Google. Finally, I use a single-sided model to show that, in the absence of its Aftermarket Restrictions, Google would be compelled to respond to competition by dropping its take rate in the In-App Aftermarket, which would result in lower prices to consumers.

34. Using data, economic methods, and evidence common to all Class members, I demonstrate how aggregate damages and antitrust injury attributable to Google's anticompetitive conduct can be assessed through a reduced take rate or increased consumer Play Points subsidies. I also demonstrate how common methods and evidence can be used to measure specific Class-member damages, based on the 35 categories of Apps that Google uses to track user purchase activity.

35. The remainder of the report is organized as follows. In Part I, I explain why Apple's iOS does not constrain Google's market power in the Android App Distribution Market or the Android In-App Aftermarket. In Part II, I explain why these two markets are distinct relevant antitrust product markets. In Part III, I examine Google's anticompetitive conduct in the Android App Distribution Market, defining the contours of the relevant market, establishing Google's market power in that market, describing the restraints imposed by Google, and describing how multi-homing and steering would combine to lower Google's take rate in the Android App Distribution Market. In Part IV, I perform the same analysis for the In-App Aftermarket and additionally explain why the Single Monopoly Profit theory does not apply, and therefore Google is obtaining additional profits from leveraging its power into the In-App Aftermarket that it could not have obtained from the Android App Distribution Market alone. In Part V, I analyze and assess the impact of Google's anticompetitive conduct in the relevant markets. In Parts VI and VII, I estimate damages in the aggregate and at the individual level, respectively. The analysis in all these parts relies on methods and evidence common to members of the proposed class.

I. APPLE'S iOS DOES NOT CONSTRAIN GOOGLE'S MARKET POWER IN THE ANDROID APP DISTRIBUTION MARKET OR IN-APP AFTERMARKET

36. Mobile device OEMs must either develop their own operating system or license an operating system from a third party. Apple is the only significant device manufacturer to develop and maintain its own operating system, iOS, which works exclusively on Apple devices. For all other OEMs, Google is the dominant provider of licensed mobile device operating systems. Google Android OS makes up nearly all licensed mobile operating systems, 73 percent of mobile operating systems worldwide (even including China),[38] and 40 percent of mobile operating systems in the United States.[39]

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37. As explained below, Play Points is a customer loyalty program implemented by Google, similar to those frequently offered by credit card issuers and airlines. I use the term "Play Points" throughout this report as shorthand for promotions funded by Google that decrease the net price that consumers pay for Apps and In-App Content.

38. *Statista Mobile OS Shares, supra*. Statista does not break out China separately. Android and iOS collectively account for 99 percent share as of June 2021. *Id.*

39. Statcounter, *Mobile Operating System Market Share United States of America*, (accessed Feb. 4, 2022), *available at* gs.statcounter.com/os-market-share/mobile/united-states-of-america.

A. Google Android and Apple iOS Have Market Power in the Mobile Device Operating Systems Market

37. At present, there is a virtual duopoly in the market for mobile device operating systems with the market split between mobile devices running on Apple's iOS and Google Android.[40] The combined share of Android and iOS mobile devices is estimated to exceed 99 percent.[41] There are several minor mobile operating systems, but collectively they account for less than one percent of the worldwide market. While Android accounts for over 70 percent of the worldwide market, mobile devices running iOS command nearly 60 percent of sales in the United States.[42] Industry analysts attribute the difference in market penetration to the higher cost of the iPhone, which is beyond the means of many non-U.S. residents.[43]

38. Even firms with desktop operating systems such as Microsoft have failed to make significant inroads into mobile device operating systems. In January 2019, Microsoft announced that it would end support for its Windows 10 mobile operating system.[44] Microsoft's failure is consistent with significant barriers to entry in mobile operating systems markets.

B. While Android Mobile Devices May Compete at the Point of Initial Device Purchase, Lock-In Results in Distinct Markets for App Distribution

39. Google Android mobile devices and Apple compete for users with respect to the initial choice of a device and associated ecosystem. But once a user selects either a Google Android or iOS device, that user is largely locked in. Because apps are neither interoperable nor transferable, a user switching from an iOS device to a Google Android device or vice versa cannot simply bring all apps to the new phone. The user must re-download and install apps, and may need to find substitutes for apps not available on the new OS. Users may need to repurchase paid apps and any in-app content, and they may end up losing their app-related data if unable to transfer.[45] Transferable app data and customization settings must be transferred to the new device, a process

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40. *Statista Mobile OS Shares*, *supra*. For purposes of this class certification report, I include tablets in the market for mobile device operating systems, as OEMs (the buyer of mobile operating systems) selling both tablets and smartphones prefer that the operating system work seamlessly across mobile device types. *See, e.g.*, Vangie Beal, *What Are Examples of Mobile Operating Systems?*, Webopedia (Jan. 27, 2022), *available at* www.webopedia.com/insights/mobile-os-and-different-types/. The OEM's demand for compatibility in operating systems across the device types is derived from the demand from consumers, who share the same preferences. *See* Part I.B, *supra*, discussing customer lock-in for operating systems. When performing econometrics and estimating damages, I also include App transactions on tablets in Google's transactional database. In any event, my opinions regarding Google's market power or common impact flowing from the Challenged Conduct do not turn on whether tablets are included or excluded.

41. *Statista Mobile OS Shares*, *supra*. This estimate includes China.

42. *See* Jack Wallen, *Why is Android more popular globally, while iOS rules the US?*, TECH REPUBLIC, (May 12, 2021), *available at* www.techrepublic.com/article/why-is-android-more-popular-globally-while-ios-rules-the-us/.

43. *Id.*

44. *See* Rob Enderle, *How Microsoft failed with Windows 10 Mobile*, COMPUTERWORLD, (Jan. 24, 2019), *available at* www.computerworld.com/article/3336057/how-microsoft-failed-with-windows-10-mobile.html.

45. Nabila Amarsy, *Switching Costs: 6 Ways to Lock Customers Into Your Ecosystem*, STRATEGYZER, (July 27, 2015), *available at* www.strategyzer.com/blog/posts/2015/7/27/switching-costs-6-strategies-to-lock-customers-in-your-ecosystem ("The 'Data trap'… encourages customers to create or purchase content or apps that are exclusively hosted on a platform.").

that entails additional time and effort.[46] Likewise, subscriptions might need to be cancelled and re-subscribed when switching platforms.[47]

40. Google's internal documents provide [redacted] A [redacted][49] The presentation [redacted][50] Other Google documents identify [redacted][51] Google's analysis from 2017 concluded that [redacted][52]

41. Once someone is accustomed to using a brand, there can be identity and loyalty factors inhibiting changing to another,[53] raising the costs of switching. These various switching costs—reinstallation and substitution, transferring data, re-subscribing, and brand loyalty—are also all paired with the tedious process of learning the new operating system.[54] The Play Store allows Google to reach users who then download Android Apps, which creates brand loyalty to Android. Indeed, Google recognizes that the Play Store [redacted][55]

42. Users also benefit from the complementarity of multiple devices; switching ecosystems often requires relinquishing those benefits. For instance, a user might use her smartphone when traveling during the day and switch to using a tablet later at night. This user would likely gain value from the ability to sync files, settings, user information, and other features among these multiple devices.[56] Yet many apps do not allow for this synchronization across

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46. *Id.*

47. Economists recognize that firms in ancillary markets or aftermarkets may wield power *even when* the forward market is competitively supplied. For a review of the literature, see Hal Singer & Andrew Card, *Lessons from Kahneman's Thinking Fast and Slow: Does Behavioral Economics Have a Role in Antitrust Analysis?*, ANTITRUST SOURCE (2012), *available at* www.semanticscholar.org/paper/Lessons-from-Kahneman-%E2%80%99-s-Thinking-%2C-Fast-and-Slow-Kahneman/8abf422dc2aca5adf6fe6c20e9064863f64819dd?p2df. As noted in Part I.A, Apple does not constrain Google in the forward market for licensed mobile operating systems, and thus the forward market is hardly competitively supplied.

48. GOOG-PLAY-007317466 at GOOG-PLAY-007317467. Pixel is a Google smartphone.

49. *Id.* at GOOG-PLAY-007317473.

50. *Id.* at GOOG-PLAY-007317479.

51. GOOG-PLAY-000880576.R at GOOG-PLAY-000880580.R.

52. *Id.* at GOOG-PLAY-000880584.R. Google's analysis concerned [redacted] It further concluded that [redacted] *Id.* at GOOG-PLAY-000880589.R.

53. *See* Thomas A. Burnham, Judy K. Frels, and Vijay Mahajan, *Consumer Switching Costs: A Typology, Antecedents, and Consequences*, 31(2) JOURNAL OF THE ACADEMY OF MARKETING SCIENCE 109-126 (2003).

54. [redacted] *See, e.g.*, GOOG-PLAY-002416488 ([redacted]).

55. GOOG-PLAY-004237669.R at GOOG-PLAY-004237673.R.

56. Different operating systems offer different features for synchronizing devices. For instance, Microsoft Windows offers a "Your Phone" app which can tie together an android operated phone and computer. Similarly, Apple

different operating systems. Accordingly, effective transfer to the Google Android or Apple ecosystem may entail switching multiple devices.

43. This complementarity also takes place within groups of people. For instance, a family of four that is contemplating purchasing multiple devices would value the ability to integrate their apps and files—perhaps through parental controls on apps and screen time, location tracking abilities, and through family plans allowing the sharing of purchases and subscriptions.[57] To achieve this compatibility, the family would likely need to all use the same operating system, leading them to become "locked in" to that ecosystem.[58] This type of lock-in can also lead to brand loyalty.[59] That consumer lock-in occurs with the initial decision with respect to handsets (and the associated mobile operating system) is consistent with lock-in in other contexts and is widely noted in the economics literature.[60]

44. Consumer lock-in is precisely what happens for users who choose a Google Android phone (many of whom outside of the United States cannot afford an iPhone). The average holding period for an Android phone is typically two years, or longer than the time required to test for a "sustained" price increase by a hypothetical monopolist under the test for market definition set forth by the United States Department of Justice and Federal Trade Commission in their *Horizontal Merger Guidelines*. Moreover, Android users display a high degree of brand loyalty, at around 89 to 91 percent over the year 2017,[61] which means that even on their next phone purchase, they are unlikely to purchase an Apple iPhone, especially given its much higher price—on average 2.7 times the cost of the typical Android phone.[62] Internal Google figures [redacted]

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offers a "Continuity" app with similar features for Apple products. *See* David Nield, *Make your phone and computer team up to get more done*, POPULAR SCIENCE, (Oct. 20, 2018), *available at* www.popsci.com/phone-computer-work-together/.

57. For example, Apple's "Family Sharing" allows families to share services such as Apple Music, Apple TV+, App Store purchases, iCloud storage, and photo albums. It also allows parents to approve what their children purchase, limit their time on devices, and see their location. *See* Apple, *What is Family Sharing?, available at* support.apple.com/en-us/HT201060. *See also* giffgaff, *How to set up family sharing on iPhone and Android*, (July 26, 2019), *available at* www.giffgaff.com/blog/how-to-set-up-family-sharing-on-iphone-amp-android/ (describing the process of setting up the Google Play Family Library service).

58. Travers Korch, *How tech ecosystems lock you into costs*, BANKRATE, (Sep. 30, 2014), *available at* web.archive.org/web/20210602055404/https:/www.bankrate.com/finance/smart-spending/tech-ecosystems-cost-you-1.aspx%20.

59. Paul Klemperer, *Markets with Consumer Switching Costs*, 102(2) QUARTERLY JOURNAL OF ECONOMICS 375-394, 376 (1987) ("In all these markets [with switching costs] rational consumers display brand loyalty when faced with a choice between functionally identical products. Products that are ex ante homogeneous become, after the purchase of one of them, ex post heterogeneous").

60. *See, e.g.,* Joseph Farrell & Paul Klemperer, *Coordination and Lock-In: Competition with Switching Costs and Network Effects* 3 HANDBOOK OF INDUSTRIAL ORGANIZATION 1970-2056, 1970 (2007) ("Lock-in hinders customers from changing suppliers in response to (*predictable or unpredictable*) changes in efficiency, and gives vendors lucrative ex post market power – over the same buyer in the case of switching costs (or brand loyalty), or over others with network effects.") (emphasis added).

61. Lucas Mearian, *iOS vs. Android: When it comes to brand loyalty, Android wins*, COMPUTERWORLD, (Mar. 9, 2018), *available at* www.computerworld.com/article/3262051/ios-vs-android-when-it-comes-to-brand-loyalty-android-wins.html.

62. Amit Chowdhry, *Average iPhone Price Increases To $687 and Android Decreases To $254, Says Report*, FORBES, (Feb. 3, 2015), *available at* www.forbes.com/sites/amitchowdhry/2015/02/03/average-iphone-price-increases-to-687-and-android-decreases-to-254-says-report/?sh=d9bcd17539e4.

[redacted][63] Google marketing analytics in 2018 and 2019 found that [redacted][64] Because lock-in increases with each successive year on an Android phone, the share of Android users willing to even *consider* switching to an iPhone is falling over time.[65]

45. Because apps are operating-system specific, Apple users cannot obtain apps from the Play Store, and Android users cannot download apps from the Apple App Store. Accordingly, while Google and Apple undoubtedly compete for users in the adoption of devices powered by their respective operating systems, once a user has elected the Android ecosystem, Apple's App Store cannot provide that user with apps and cannot compete with Google in the distribution of apps.[66] Further, the presence of switching costs and the lack of information that consumers receive at the point of device purchase[67] allows Google to extract supracompetitive profits from developers and consumers alike, as iOS does not serve as a significant constraint on Google's exercise of its monopoly power in the Android App Distribution Market.

C. Google Has Monopoly Power in the Distinct Market for Licensed Operating Systems

46. Apple does not license its iOS to any other OEM. Thus, from an OEM's vantage, iOS is not a substitute for licensed mobile operating systems. In terms of the test for market definition in the *Horizontal Merger Guidelines*, a small, but significant, non-transitory increase in price (a "SSNIP") by a hypothetical monopolist of licensed operating systems could not induce any OEM to install iOS instead, as Apple will not grant such a license. Moreover, the costs and complexities of developing an operating system are so high that a SSNIP by a hypothetical monopolist of licensed operating systems would not plausibly induce an OEM to create its own system or a rival mobile OS developer to enter. Google dominates the market for licensed mobile operating systems through its Android OS, with nearly a 100 percent share of this market. Herbert Hovenkamp, the co-author of a leading antitrust treatise, recently observed, "[D]igital markets are

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63. GOOG-PLAY-000572041.R at GOOG-PLAY-000572048.R.

64. GOOG-PLAY-004556784 at GOOG-PLAY-004556793 (Q3 2018 marketing analytics); GOOG-PLAY-005705974 at GOOG-PLAY-005705985 (Q4 2019 marketing analytics).

65. *See, e.g.*, Abhin Mahipal, *Survey: 18% of Android users would consider switching to iPhone 13, but this is down 15% from last year*, SELLCELL, (Aug. 31, 2021), *available at* www.sellcell.com/blog/survey-18-percent-of-android-users-would-consider-switching-to-iphone-13/. It bears noting that the mere *consideration* of switching does not imply an actual switch, as consideration does not entail any switching costs. In other words, although the survey states only 18 percent of Android users would consider switching, not all of those respondents would in actuality switch.

66. The court in *Epic v. Apple* found that the relevant market for Epic's gaming-centric complaint was the "mobile gaming market," which included iOS and Android mobile devices. There the court followed the factors from *Newcal Indus., Inc. v. Ikon Office Sol.*, 513 F.3d 1038, 1049-50 (9th Cir. 2008), which are divorced from economic teachings, to reject a single-product aftermarket. In particular, there is no economic requirement that consumers be duped in order to be locked into the Android operating system and then beholden to a provider in the Android App Distribution Market. Lock-in is not an information problem. Movie patrons who pay supra-competitive prices for popcorn, or hotel guests who pay supra-competitive prices for movie rentals are not duped; they simply do not wish to incur the costs of leaving the movie theater (or hotel) to find a cheaper substitute for the ancillary product. In any event, Play Store users have no understanding of the mapping from restraints into developer take rates into prices; to the extent *Newcal* (improperly) requires an information problem for the existence of an aftermarket, it is here in spades.

67. For instance, consumers are not told that developers are generally charged 30 percent for every paid app or in-app purchase, nor are they told of Google's restrictions on OEMs, carriers, and developers that result in foreclosure of competitive application stores. Instead, they have historically been told that Google's Android is an "open" system. Without knowledge of the anticompetitive restrictions, there is no way for consumers to know that they will effectively be locked into a product that extracts supracompetitive profits every time they make a purchase.

particularly susceptible to direct measurements of market power that do not depend on a market definition."[68] Such "direct" proof relies on firm-specific information that speaks directly to a firm's ability to profitably raise prices or exclude rivals.[69] Google's monopoly in licensed operating systems is well-established and is demonstrated through both direct and indirect methods.

1. Direct Evidence

47. Google gained power in the licensed mobile device operating system through its acquisition of Android and partnerships with OEMs and mobile carriers. OEMs could not license Apple's iOS to manufacture mobile devices, but Google's Android OS and its proprietary suite of mobile apps and interfaces, Google Mobile Services, was available under license. While Android itself is available pursuant to an open-source Apache license, Google used the revenue-sharing agreements to attract OEMs and mobile carriers to select Google Android. In its revenue-sharing agreements, Google offered OEMs and mobile carriers [redacted][70] The ability to exclude rivals—here, rival licensable operating systems that lacked a dominant search advertising business with which to fund OEMs and mobile carriers—is a hallmark of market power.[71]

2. Indirect Evidence

48. Google's high share of the licensed mobile device operating systems market is protected by barriers to entry. Entry barriers in the market for mobile operating systems are steep.[72] Launching a competing mobile operating system requires developing the source code, contracting with OEMs, and convincing a critical mass of developers to write apps that are compatible with the new operating system, among other hurdles.[73]

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68. Herbert Hovenkamp, *Digital Cluster Markets*, COLUMBIA BUSINESS LAW REVIEW 1-30 (forthcoming 2022).

69. *Id.* at 24 ("By contrast, 'direct' proof relies on estimates of firm elasticity of demand, evidenced mainly by a firm's price-cost margins or output responses to price changes.[] These methodologies are capable of giving more accurate measures of market power as it is best defined, which is the ability of a firm to profit by raising its price above its costs.[]") citing 2B Phillip E. Areeda & Hebert Hovenkamp, ANTITRUST LAW ¶521 (5th ed. 2021) (forthcoming); Louis Kaplow, *Why (Ever) Define Markets?,* 124 HARVARD LAW REVIEW 437 (2010).

70. *See, e.g.*, GOOG-PLAY-001184813 at GOOG-PLAY-001184820 ([redacted]

71. *See, e.g.*, Richard G. Price, *Market Power and Monopoly Power in Antitrust Analysis*, 75(1) CORNELL LAW REVIEW 190-217, 190, 198 (1989).

72. *See, e.g.*, Alan Santillan, *Mobile Software: Why It's Only Android vs. iOS in 2020*, LEARN HUB, (July 30, 2018), *available* at learn.g2.com/android-vs-ios ("Barriers to entry in the mobile space are extremely high, and the switching costs that Android and iOS deploy toward their users make it even harder for buyers to switch platforms."); European Commission, Antitrust: Commission sends Statement of Objections to Google on Android operating system and applications – Factsheet, (Apr. 20, 2016), *available at* ec.europa.eu/commission/presscorner/detail/en/MEMO_16_1484 ("There are a number of barriers to entry that protect Google's position, including so-called network effects (that is, the more consumers adopt an operating system, the more developers write apps for that system).").

73. *See, e.g.* Michael Katz & William Rogerson, *The Applications Barrier to Entry and Its Implication for the Microsoft Remedies: Comment on Iansiti and Richards*, 75 ANTITRUST LAW REVIEW 723-738 (2008-09) (explaining that a new OS will be desirable to consumers only if a broad array of software applications can run on it, but software developers will find it profitable to create applications that run on an operating system only if there is a large existing base of users).

49. Google cemented its early market power in licensed mobile device operating systems by exploiting a natural feedback loop in which device makers adopted Android with Google Mobile Services, including Google's proprietary App distribution channel, which in turn attracted app developers, which in turn attracted consumers who sought Android phones.[74] Google Android's monopoly in the licensed mobile device operating systems market benefits from what economists call "indirect network effects"—in this case meaning that the more developers who write apps compatible with an operating system, the more OEMs and consumers demand the operating system. This cycle of indirect network effects constitutes another barrier to potential suppliers of competing licensed mobile device operating systems.[75]

II. THE ANDROID APP DISTRIBUTION MARKET AND THE IN-APP AFTERMARKET ARE DISTINCT RELEVANT MARKETS

50. The purchaser of a Google Android device always receives the device with the Play Store pre-installed and its icon prominently displayed. Through the Play Store, consumers can access a broad array of Apps offered by myriad developers. Thus, the Play Store is a two-sided matchmaking platform where Google brings together developers wishing to distribute Apps and consumers wishing to obtain Apps to use on their Google Android devices. The initial download of an app may be considered the consummation of the matchmaking service, giving rise to an offer (by the developer) and acceptance (by the user). Once an App is downloaded onto the Google Android mobile device, however, the Play Store's matchmaking role for the initial download is at an end because the developer has found the consumer and created its own independent channel of distribution with that consumer by virtue of the installation of the developer's App on the consumer's device. Through its App, the developer now has a direct pipeline to the consumer for both communication and purchases of In-App Content. As discussed more fully below, the Android App Distribution Market and In-App Aftermarket are economically distinct.

51. A two-sided platform matches buyers (in this case consumers) and sellers (in this case app developers). Two-sided platforms benefit from "indirect network effects," meaning that each additional buyer makes the platform more appealing to sellers[76] Buyers wish to transact on the platform with the greatest variety of content to choose from, and sellers wish to reach the largest buyer base possible. In the context of the Android App Distribution Market, Google connects consumers of Apps with developers through the Play Store. The presence of more consumers makes the Play Store more appealing to developers, and the presence of more developers make the Play Store more appealing to consumers.[77] A two-sided platform creates

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74. *See, e.g.,* GOOG-PLAY4-000336290.

75. *See, e.g.,* GOOG-PLAY-004559725.R at GOOG-PLAY-004559759.R ( ) *See also* GOOG-PLAY-004508011 at GOOG-PLAY-004508012 ( ).

76. *See, e.g.,* David Evans, *Two-Sided Market Definition* in MARKET DEFINITION IN ANTITRUST: THEORY AND CASE STUDIES (ABA Section of Antitrust Law) 1-35, 5 (2009), *available at* papers.ssrn.com/sol3/papers.cfm?abstract_id=1396751 ("A key feature of two-sided platforms is the presence of 'indirect network effects.').

77. Marc Rysman, *The Economics of Two-Sided Markets*, 23(3) JOURNAL OF ECONOMIC PERSPECTIVES 125-143, 126 (2009).

value by harnessing these indirect network effects to increase the number of participants on each side of the platform.

52. When it comes to the purchase of In-App Content, the customer and the developer have already found each other. The derived demand for services in support of the purchase of In-App Content in the In-App Aftermarket thus lacks any indirect network efforts: adding more consumers or developers does not add value to the relationship between a developer-customer pair or the associated services in support of consummating in-App transactions. Matchmaking services, critically present in the Android App Distribution Market, are not present in the In-App Aftermarket. And the Android App Distribution Market does not provide services sufficient to complete the delivery of In-App Content to the consumer. The In-App Aftermarket is therefore economically distinct from the two-sided platform market contemplated in *Ohio v. American Express* ("*Amex*"), in which the Supreme Court emphasized the determinative role of "indirect network effects,"[78] which "exist where the value of the two-sided platform to one group of participants depends on how many members of a different group participate."[79]According to the Supreme Court, when "the indirect network effects operate in only one direction," the market "behaves much like a one-sided market and should be analyzed as such."[80]

53. Moreover, I understand that Professor Schmidt will show that, as a technological matter, there is no basis for Google to insert itself into the In-App Aftermarket by requiring that developers use Google Play Billing. Google's forced insertion into the In-App Aftermarket is properly analyzed as an anticompetitive extension of the power it possesses in the separate and distinct Android App Distribution Market. My analysis first examines these two relevant markets, and my models of common impact are aimed at these markets separately, with a few caveats. To model the scenario where rival app stores compete on the dimension of a consumer subsidy (rather than on take rates), I treat the two markets as a single market, under the assumption that any enhanced Play Points could be used by consumers for both paid initial downloads and the purchase of In-App Content. I also offer a model in which rival app stores compete on the take rate assuming (in the alternative) the two markets are a single market.

III. GOOGLE'S ANTICOMPETITIVE CONDUCT IN THE PRIMARY ANDROID APP DISTRIBUTION MARKET

54. In this Part, I use data, economic methods, and evidence common to all Class members to establish that the Android App Distribution Market is a relevant market for analysis, that Google possesses monopoly power in this market, and that Google has engaged in anticompetitive conduct as a means of furthering and retaining its monopoly power in this market. Note that while I reference Google's contractual restraints impacting OEMs, mobile carriers, and

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78. *Ohio v. American Express Co.*, 585 U.S. ___ (2018), *available at* www.supremecourt.gov/opinions/17pdf/16-1454_5h26.pdf.

79. *Id.* at 3.

80. *Id.* at 12-13 ("To be sure, it is not always necessary to consider both sides of a two-sided platform. A market should be treated as one-sided when the impacts of indirect network effects and relative pricing in that market are minor. Newspapers that sell advertisements, for example, arguably operate a two-sided platform because the value of an advertisement increases as more people read the newspaper. But in the newspaper-advertisement market, the indirect network effects operate in only one direction; newspaper readers are largely indifferent to the amount of advertising that a newspaper contains. Because of these weak indirect network effects, the market for newspaper advertising behaves much like a one-sided market and should be analyzed as such.").

developers in the context of discussing Google's power in the relevant markets, I reserve in-depth discussion of such restraints for the sections on anticompetitive conduct.

A. The Android App Distribution Market Is a Relevant Antitrust Market

55. By Google's estimate, there were over three billion Android devices in the world as of May 2021.[81] To access this customer base of Android users, developers design Apps for Android devices. Developers traditionally reach users through App stores installed on the users' device, but also can distribute their Apps to consumer devices directly from developer websites through a process known as "sideloading."[82]

56. While the Play Store is pre-installed on every Google Android mobile device, sideloading requires independent consumer knowledge of the developer's website and the circumvention of onerous technical barriers imposed by Google. *See* Part III.D.4, *infra.* As a practical consequence, the effective Android App Distribution Market consists almost entirely of Android App stores that have been pre-installed on the mobile device. Although app stores, like some other two-sided platforms, benefit from indirect network effects, the market for initial App downloads need not always tend toward monopoly.[83] Without the multiple restrictions that Google has imposed, consumers would have easier access to multiple cross-platform app stores.[84]

57. The Android App Distribution Market is a distinct relevant antitrust market under the *Horizontal Merger Guidelines*' SSNIP test. To begin, I analyze the developers' side of the market. To list their Apps, developers pay the Play Store a small up-front fee of $25 plus a take rate of revenues for paid downloads.[85] If a hypothetical app-store monopolist that distributed Android-compatible Apps were to raise its take rate above competitive levels by a small but

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81. Alex Cranz, *There are over 3 billion active Android devices. That's a lot of smartphones*, THE VERGE, (May 18, 2021), *available at* www.theverge.com/2021/5/18/22440813/android-devices-active-number-smartphones-google-2021. The author notes this estimate is conservative because the data are "taken from the Google Play Store, which doesn't take into account devices based on Android but that use alternative stores, including Amazon Fire devices…" *Id.*

82. For the purpose of this class certification report, I exclude sideloading from the Android App Distribution Market. Sideloading is partially an artifact of Google's restraints, as some developers such as Epic pulled their App outside of the Play Store to evade Google's excessive take rates, leaving users with no choice but to sideload to access the App. *See* Nick Statt, *Apple Just Kicked Fortnite Off the App Store*, THE VERGE (Aug. 13, 2020), *available at* www.theverge.com/2020/8/13/21366438/apple-fortnite-ios-app-store-violations-epic-payments ("Epic previously bypassed Google's Play Store on Android by releasing *Fortnite* as a direct download through its own software launcher. But the studio eventually relented earlier this year after failing to appeal Google for an exemption of its similar 30 percent cut of all in-app purchases."). Given the hassles imposed on the user, many of which are imposed by Google (see Part III.D.4, *infra*), sideloading is presently an inferior substitute to downloading an App from an app store. The inclusion or exclusion of sideloading has no bearing on my opinions regarding Google's market power or on my proof of common impact.

83. *See, e.g.*, Mark Looi, *On "The Platform Delusion" by Jonathan Knee*, MEDIUM (Dec. 21, 2021), *available at* marklooi.medium.com/on-the-platform-delusion-by-jonathan-knee-a787a672b932.

84. Google has produced data [redacted] in 2019 and 2020. GOOG-PLAY-001508603 ("Apps by Source"). This does not represent the share of apps sideloaded by users to avoid the Play Store. The 70 to 80 percent statistic is driven by [redacted] *Id*. The same data show that [redacted] *Id*.

85. Play Console Help, *How to use Play Console*, *available at* support.google.com/googleplay/android-developer/answer/6112435?hl=en#zippy=%2Cstep-pay-registration-fee ("there is a US$25 one-time registration fee").

significant amount, say by five percent in accordance with the *Guidelines*, developers on the monopoly app store would not stop distributing their Apps through that app store, because the Android App Distribution Market is too large to forgo. Android devices account for 40 percent of the mobile devices purchased in the United States, and 70 percent of mobile devices bought globally.[86] Developers cannot earn a profit until the margins on their initial downloads or related In-App Content cover the often substantial development and marketing costs.[87] As long as incremental sales of Apps are bringing value to developers and paying down their fixed costs, they would not abandon distribution through the Android platform in the event of a small but significant price increase over competitive levels. Further, sideloading is [redacted][88]

58. Within the Android App Distribution Market, the Play Store has power in large part because of its broad reach. Record evidence suggests that developers are attracted to the Play Store [redacted][89] In 2015, Google asked Dr. Itamar Simonson to [redacted] Dr. Simonson concluded that the [redacted] In short, developers of Android-compatible Apps would be [redacted] and hence the Android Application Distribution Market is a distinct relevant antitrust market.

59. Turning to the consumer side, while it is hypothetically possible that consumers might switch to an Apple device as a result of increased take rates by an Android app store, this hypothetical possibility is unrealistic. Consumers are not aware of take rates charged to

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86. Statcounter, *Mobile Operating System Market Share Worldwide*, (accessed Feb. 2022), *available at* gs.statcounter.com/os-market-share/mobile/worldwide/#yearly-2019-2019-bar. Android and iOS collectively account for 99.68 percent share, while Windows accounts for 0.01 percent of the mobile operating system market worldwide. Statcounter, *Mobile Operating System Market Share United States of America,* (accessed Feb. 2022), *available at* gs.statcounter.com/os-market-share/mobile/united-states-of-america.

87. *Development Options and Costs*, Business Information Systems: Design an App for That, Table 7.1 "Various Fixed Costs", *available at* saylordotorg.github.io/text_business-information-systems-design-an-app-for-that/s11-01-development-options-and-costs.html.

88. *See, e.g.,* Koh Dep. at 50:14-51:5 ([redacted]); *Id*. at 101:21-102:14 ([redacted]).

89. *Id.* at 89:25-90:9 ([redacted]); *Id.* at 321:19-323:1 ([redacted]); *Id.* at 324:6-12 (same consideration for the developer Electronic Arts).

90. GOOG-PLAY-007317611 at GOOG-PLAY-007317613 (Report of Dr. Itamar Simonson, Feb. 8, 2016). [redacted] *Id.* at GOOG-PLAY-007317618. The survey was administered between December 28, 2015 and January 22, 2016. *Id.* at GOOG-PLAY-007317619.

91. *Id*. at GOOG-PLAY-007317613.

92. *Id.* at GOOG-PLAY-007317615.

developers.[93] Even if consumers were aware of the take rates charged to developers, they would not be aware of the Play Store's restrictions on developers nor of how such restrictions influence the prices charged to consumers for App downloads. Because Google has prohibited developers from steering consumers to lower-cost alternative platforms, consumers have little or no experience with discounting.

60. A hypothetical monopolist in the Android App Distribution Market would be able to profitably increase consumer prices above competitive levels. Even if consumers had perfect information about take rates and the restrictions on developers as well as their implications for App prices over the lifecycle of the device (which they do not have in the actual world), very few would switch their device and operating system in response to a small, but significant, difference in the take rate charged to developers by a monopolist app store. That is especially true for Android phone users due to the significantly higher prices of Apple iPhones, which are nearly three times as expensive on average as Android phones.[94] A price difference this large would require extraordinary spending by consumers on Android Apps for a five percent increase in the app store take rate to render a switch economically plausible.[95] Further, the vast majority of Android users (nearly 80 percent) keep their Android phones for over a year, and many (nearly 30 percent) keep their phones for over two years.[96] As a result of the factors contributing to lock-in explained in Part I.B, consumers display a high degree of loyalty to the operating system they have chosen and learned, and they would not switch devices due to a small, but significant, increase in the take rate or associated app price for Android App distribution.[97]

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93. Rachel Rickard Straus, *Apple faces landmark legal claim that could pay out to millions: Rip-off that adds 30% to price of smartphone apps*, THIS IS MONEY, (Dec. 11 2021), *available at* www.thisismoney.co.uk/money/bills/article-10299235/Rip-adds-30-price-smartphone-apps.html ("Most customers do not realise they are in effect paying huge commissions. But claimants say Apple and Android users have no alternative so Apple and Google can effectively charge what they like.").

94. Amit Chowdhry, *Average iPhone Price Increases To $687 and Android Decreases To $254, Says Report*, FORBES, (Feb. 3, 2015), *available at* www.forbes.com/sites/amitchowdhry/2015/02/03/average-iphone-price-increases-to-687-and-android-decreases-to-254-says-report/?sh=d9bcd17539e4.

95. A 2021 survey found that only 5.2 percent of users chose "better prices" as a reason why Android users would consider switching to an iPhone. This implies that the switch would be unlikely and uneconomic for most, regardless of whether "better prices" meant better prices for the device or for the apps. Among the other reasons were "[l]onger software support," "Apple ecosystem integration," and "[b]etter privacy protection." *See* Abhin Mahipal, *Survey: 18% of Android users would consider switching to iPhone 13, but this is down 15% from last year*, SELLCELL, (Aug. 31, 2021), *available at* www.sellcell.com/blog/survey-18-percent-of-android-users-would-consider-switching-to-iphone-13/.

96. Consumer Intelligence Research Partners, *How Long Do Android Users Own an Android Phone*, (Sep. 21, 2016), *available at* files.constantcontact.com/150f9af2201/a238f4a1-5b70-4853-b21e-226c94104d30.pdf. It bears noting that these data are from 2016, and the trend across all devices is to keep phones for even longer periods. *See* Abigail Ng, *Smartphone users are waiting longer before upgrading — here's why*, CNBC, (May 17, 2019), *available at* www.cnbc.com/2019/05/17/smartphone-users-are-waiting-longer-before-upgrading-heres-why.html. ("In 2016, American smartphone owners used their phones for 22.7 months on average before upgrading. By 2018, that number had increased to 24.7.").

97. *See, e.g.,* Chuck Jones, *Apple's iOS Loyalty Rate Is Lower Than Google's Android, But Apple May Steal More Users Each Year*, FORBES, (Mar. 10, 2018), *available at* www.forbes.com/sites/chuckjones/2018/03/10/apples-ios-loyalty-rate-is-lower-than-googles-android-but-apple-may-steal-more-users-each-year/?sh=29b39ae68a8e ("Loyalty is also as high as we've ever seen, really from 85-90% at any given point. With only two mobile operating systems at this point, it appears *users now pick one, learn it, invest in apps and storage, and stick with it*.") (emphasis added). *See also* Consumer Intelligence Research Partners, *Mobile Operating System Loyalty: High and Steady,* (Mar. 8, 2018), *available at* files.constantcontact.com/150f9af2201/4bca9a19-a8b0-46bd-95bd-85740ff3fb5d.pdf ("CIRP

61. In sum, analyzing whether there is an Android App Distribution Market from both the developer and consumer perspectives leads to the conclusion that it is a distinct relevant antitrust market. Any competition that might exist between Google and Apple with respect to operating systems does not significantly constrain Google's ability to extract supra-competitive prices in the Android App Distribution Market. That Apple[98] (in November 2020) and Google[99] (in March 2021) lowered take rates for small developers to 15 percent within a few months of each other does not imply one take-rate reduction was caused by the other, nor does it imply that their two app stores significantly discipline each other's prices (for developers) and thus are in the same product market. The moves came just after antitrust lawsuits were filed in August 2020, and Congress published a report on the platforms' conduct in October 2020.[100] Internal Google documents also suggest that [redacted][101]

62. The availability of apps on personal computers (PCs) or consoles does not expand the relevant antitrust market. From a developer's perspective, the mobile, Android App ecosystem represents too large a customer segment to ignore.[102] Indeed, the sales of mobile games are roughly equal to the *sum* of sales of console and PC games.[103] Not only would developers sacrifice significant sales by walking away from the Play Store, but, for those who had not yet done so, they would also incur additional expense to write code for an Android-based App to work in a console or PC environment. Similarly, from a consumer's perspective, the functionality of a PC or gaming console is distinct from that of a smartphone, which explains why households commonly own all three types of devices, using each technology for distinct purposes. Further, in the case of a consumer who owns an Android phone but not a console or PC, any substitution towards consoles or PCs would require the purchase of new hardware, further reducing the viability of significant defection.

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finds that between Android and iOS, loyalty to each has remained steady since early 2016, at the highest levels seen. Android has a 91% loyalty rate, compared to 86% for iOS, measured as the percentage of customers that remain with each operating system when activating a new phone over the twelve months ending December 2017.").

98. Kif Leswing, *Apple will cut App Store commissions by half to 15% for small app makers*, CNBC, (Nov. 18, 2020), *available at* www.cnbc.com/2020/11/18/apple-will-cut-app-store-fees-by-half-to-15percent-for-small-developers.html (describing the take-rate decrease as a "high-profile olive branch from Apple to lawmakers.").

99. Chaim Gartenberg, *Google will reduce Play Store cut to 15 percent for a developer's first $1M in annual revenue*, THE VERGE, (Mar. 16, 2021), *available at* www.theverge.com/2021/3/16/22333777/google-play-store-fee-reduction-developers-1-million-dollars.

100. *Id*. ("The new policy also comes at a critical moment when Google (and Apple's) app store policies are under intense public scrutiny, kicked off by the removal of Epic Games' *Fortnite* from both the App Store and Play Store and the game developer's subsequent antitrust lawsuits against Apple and Google.").

101. Google's documents suggest [redacted] *See* GOOG-PLAY-007317535 ([redacted]); GOOG-PLAY-007317528 ([redacted]).

102. The value of transactions in the Play Store reached $38.6 billion in 2020. *See* Mansoor Iqbal, *App Revenue Data (2022)*, BUSINESS OF APPS, (Feb. 16, 2022), *available at* www.businessofapps.com/data/app-revenues/ (citing App Annie and Sensor Tower).

103. WEPC, *Console Gaming Statistics 2022,* (Jan. 20, 2022), *available at* www.wepc.com/statistics/console-gaming/.

63. As described in more detail in Part V.A.4, the Epic Games Store[104] and Microsoft[105] have both charged developers a 12 percent take rate on their respective PC game platforms. That this large disparity in take rates persists implies that developers perceive the Play Store to be a unique outlet, and developers are beholden to Google to reach their critical audience of consumers. And Google has not changed its pricing in response to changes in take rates from Microsoft, console makers, or the Epic Store.

64. Moreover, Google recognizes that cross-platform gaming is [redacted][106] Cross-platform gaming allows users playing the same game with different devices to play together in multiplayer modes.[107] Accordingly, cross-platform gaming has not been and is not presently a significant factor in Google's pricing to developers on its Play Store.[108]

65. "Web-based apps," or apps that reside on the Internet outside of an app store, similarly do not constrain Google's pricing on the Play Store. According to Google's documents, web-based apps are [redacted][109] Traditional Apps, which Google defines as being located on a user's home screen, are considered by Google to be the [redacted][110] Some traditional Apps can support "offline mode" or can be used without an Internet connection.[111] In most cases, after a traditional App is launched, the user is returned to the place where she left,[112] another significant benefit. "Web apps," by contrast, began simply as bookmarked links to the web version of an app, opened in a browser.[113] Unlike traditional—or "native"—apps, these web apps require an internet connection,[114] [redacted][115] cannot access useful native functions (e.g., the phone's camera),[116] and do not show up in the Android app launcher.[117] According to Google,

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104. Epic Press Release, *The Epic Games store is now live*, (Dec. 6, 2018), *available at* www.epicgames.com/store/en-US/news/the-epic-games-store-is-now-live ("The Epic Games store is now open, featuring awesome high-quality games from other developers. Our goal is to bring you great games, and to give game developers a better deal: they receive 88% of the money you spend, versus only 70% elsewhere. This helps developers succeed and make more of the games you love.").

105. Tom Warren, *Microsoft shakes up PC gaming by reducing Windows store cut to just 12 percent*, THE VERGE, (Apr. 29, 2021), *available at* www.theverge.com/2021/4/29/22409285/microsoft-store-cut-windows-pc-games-12-percent.

106. GOOG-PLAY-000231487 at GOOG-PLAY-000231489.

107. Van Vicente, *What Does Cross-Platform Mean for Gaming and Other Apps?,* HOW-TO GEEK, (Oct. 9, 2021), *available at* www.howtogeek.com/752370/what-does-cross-platform-mean-for-gaming-and-other-apps/.

108. The opinion in *Epic v. Apple* allowed for the possibility that certain games exhibit cross-platform substitutability but concluded that these games were outliers: "However, not all games are like Minecraft or Fortnite; the market still reflects that video games are, for the most part, cabined to certain platforms that take advantage of certain features of that platform, such as graphics and processing, or mobility." Rule 52 Order After Trial On The Merits, Epic Games Inc. v. Apple, Inc., Case No. 4:20-cv-05640-YGR, at 84. Because the instant matter concerns all Apps, including non-gaming Apps, the conclusion that console and PC gaming are distant substitutes for Play Store users would be bolstered.

109. GOOG-PLAY-001882239.

110. *Id*. at GOOG-PLAY-001882256.

111. *Id*. at GOOG-PLAY-001882256.

112. *Id*. at GOOG-PLAY-001882257.

113. *Id*. at GOOG-PLAY-001882261.

114. *Id*. at GOOG-PLAY-001882264.

115. *Id*. at GOOG-PLAY-001882264.

116. *Id*. at GOOG-PLAY-001882265.

117. *Id*. at GOOG-PLAY-001882263.

[redacted][118] Web based apps are no substitute for Apps on the Play Store in the Android App Distribution Market.

B. The Relevant Geographic Android App Distribution Market Is Global (Excluding China)

66. Google's Android mobile device operating system is sold throughout the world and is installed on about three quarters of all mobile devices globally, except China, where the government restricts mobile devices and operating systems and favors Chinese providers.[119] The Play Store is installed on all Google Android mobile devices by virtue of Google's "all-or-nothing" policy with respect to its GMS suite of Apps. Given the widespread distribution of the Play Store throughout the world, developers of Android-compatible Apps, wherever they are located, have strong incentives to list their Apps on a platform that can provide for distribution worldwide. The global reach of the Play Store and the developers who seek to distribute their Apps through it thus make the geographic market for the Android App Distribution Market global. That the Apps might differ in some ways by country (for example, with different languages or different features) does not change the contours of the relevant geographic market, because those changes are not material to the economics of App distribution.

67. Application of the *Horizontal Merger Guidelines*' SSNIP test confirms that the Android App Distribution Market is broader than the United States and thus global. Suppose a not-so-hypothetical monopolist in the distribution of Android-compatible Apps, such as the Play Store in the Android App Distribution Market, were to raise its take rate by a small, but significant, sustained amount in the United States. Would it attract competition from other app stores elsewhere in the world? It is plausible that a sustained increase in the take rate for initial App downloads in the United States would attract app store entrants from other countries (ignoring Google's restriction), either independently operated stores like Aptoide that already operate in multiple countries or those launched by mobile service carriers in other countries that could readily distribute Apps in the United States. Thus, the Android App Distribution Market is worldwide and is not limited to the United States.

C. Google's Market Power in the Android App Distribution Market

68. This section begins by describing evidence that directly demonstrates Google's market power in the Android App Distribution Market. I also use indirect evidence—high market shares and entry barriers—to establish that Google has market power. My assessment of the direct and indirect evidence relies entirely on data and methods that are common to the Class.

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118. *Id*. at GOOG-PLAY-001882274.

119. GOOG-PLAY-004253884 at GOOG-PLAY-004253894 ([redacted]). It bears noting that all references to "global" markets or the use of the terms "globally" or "world" in this report assume that China is excluded.

1. Direct Evidence

69. High margins imply an ability to raise prices over competitive levels. According to Google's compilations of its profit-and-loss statement for the Play Store, excluding ads, Google earned an operating profit of [redacted] in 2019, a [redacted] increase over the Play Store's profit of [redacted] in 2018.[120] Google's operating profit from the Play Store, again excluding ads, jumped to [redacted] in 2020, an increase of [redacted] from the prior year.[121] The Play Store's gross profit margin in 2020 was [redacted], and its operating profit margin was [redacted].[122] A separate spreadsheet shows that, in 2020 alone, Google earned an [redacted] on ads that appear in the Play Store, with [redacted] In 2021, the Play Store's gross profit margin was [redacted] its operating profit margin was [redacted] and its operating profit was [redacted].[124] In 2021, Google earned an [redacted] on ads that appear in the Play Store, with [redacted][125]

70. That Google profitably imposed a 30 percent take rate on developers for most paid App downloads is direct evidence of its market power over developers in the Android App Distribution Market. As shown in Part V.B.4, *infra*, this take rate is high relative to competitive benchmarks. In the presence of competition, developers would be able to offer their Apps on Android devices through multiple app stores; a developer unwilling to pay a 30-percent take rate could choose to market and distribute its App on a competing app store without losing access to most customers.

71. Google's dominance in the Android App Distribution Market, reflected in its high profits and excessive take rate, flows from its power in the licensed mobile device operating systems market. Indeed, the Android App Distribution Market could be characterized as an aftermarket to the market for licensed mobile device operating systems. Google's documents illustrate how Google's power in the market for licensed mobile device operating systems helps to ensure the Play Store's dominance. A 2019 presentation reviewing the Play Store's business model displays [redacted]

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120. GOOG-PLAY-000416245.
121. *Id.*
122. *Id.*
123. GOOG-PLAY-001090227 (showing [redacted]). These data imply that, in 2020, Google earned a gross margin on Play Store advertising revenue of [redacted]). Similarly, the 2020 operating margin inclusive of direct costs is [redacted]), and the 2020 operating margin inclusive of direct costs and cost allocations is [redacted].
124. GOOG-PLAY-010801682 (showing 2021 Play Store revenue (excluding ads) of [redacted]
125. GOOG-PLAY-010801680 (showing Play Store advertising revenue [redacted]
126. GOOG-PLAY-000443763 at GOOG-PLAY-000443768.

FIGURE 2: INTERNAL GOOGLE VIEW ON LINKAGE BETWEEN THE PLAY STORE'S DOMINANCE AND ANDROID'S DOMINANCE

The presentation recognizes that [127] in other words, Google has

72. Google considered Google observed that the obvious downside of is that it would should be done at all.[131] Since the (undated) presentation, which refers to 2018 Search and Play revenues,[132] however, Google has

73. Google's multiple restraints affecting the Android App Distribution Market—on OEMs, carriers, and developers—coupled with its technical barriers protect Google's market

127. *Id*. at GOOG-PLAY-000443769.
128. *Id*. at GOOG-PLAY-000443775.
129. *Id*.
130. *Id*. at GOOG-PLAY-000443775-776.
131. *Id*. at GOOG-PLAY-000443776-777.
132. *Id*. at GOOG-PLAY-000443770.

power in the Android App Distribution Market. As just one of the many examples of the impact of these restraints, Google's all-or-nothing bundling of the GMS suite gave it a large competitive advantage as developers were inclined to offer Apps on a platform that was guaranteed to also carry the high-value GMS Apps.[133] [redacted]

2. Indirect Evidence

74. Google's power in the Android App Distribution Market can also be gleaned indirectly via its high shares and entry barriers. As of October 2021, a total of over 21.6 billion Apps had been downloaded from the Play Store.[135] Excluding China, where the Play Store is blocked,[136] "Apple and Google control more than 95 percent of the app store market share through iOS and Android…The app economy was built on these two platforms[.]"[137] Due in part to the massive installed base of mobile Android devices, significantly more apps are downloaded from the Play Store than from the Apple App Store. For example, in 2020, there were approximately 108.5 billion downloads from the Play Store, compared with 34.4 billion through Apple App Store.[138] Excluding China, the Play Store accounted for over 80 percent of the combined global downloads from the Play Store and the Apple App Store in 2020.[139]

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133. Benjamin Edelman & Damien Geradin, *Android and competition law: exploring and assessing Google's practices in mobile*, 12(12-3) EUROPEAN COMPETITION JOURNAL 159-194, 162-163 (2016) [hereafter Edelman & Geradin].

134. Deposition of Jim Kolotorous at 110:13-111:14. Amazon, [redacted], only produces tablets, not smartphones. *Id.* 125:14-17.

135. Terry Stancheva, *17 App Revenue Statistics – Mobile Is Changing the Game in 2021*, TECHJURY, (Feb. 6, 2022), *available at* techjury.net/blog/app-revenue-statistics/#gref (citing Statista).

136. Sherisse Pham, *Google now has two apps in China, but search remains off limits*, CNN BUSINESS, (May 31, 2018), *available at* money.cnn.com/2018/05/31/technology/google-in-china-files-app/index.html ("The company's own app store, Google Play, remains blocked in China[.]").

137. David Curry, *App Store Data (2022),* BUSINESS OF APPS, (Jan. 11, 2022), *available at* www.businessofapps.com/data/app-stores/

138. David Curry, *App Data Report,* BUSINESS OF APPS (2022) at 16-17 (showing 34.4 billion downloads via iOS and 108.5 billion via Google Play).

139. According to Sensor Tower, The Play Store's total global downloads in 2020 (excluding China) were 108.759 billion (6.3 billion + 22.5 billion + 5.7 billion + 2.8 billion + 21.1 billion + 49.9 billion + 459 million = 108.759 billion). *See* Sensor Tower, *2021 – 2025 Mobile Market Forecast* (2021) at 15. The Apple App Store's total global downloads in 2020 were 34.297 billion (8.9 billion + 2.0 billion + 312 million + 1.3 billion + 7.3 billion + 13.9 billion + 585 million = 34.297 billion). *Id* at 14. 8.2 billion of these downloads come from China. *Id* at 31. Therefore, in 2020, the Play Store accounted for over 80.6 percent combined global downloads from the Play Store and the Apple App Store (equal to 108.759 billion / (108.759 billion + 34.297 billion – 8.2 billion)). Note that consumer expenditures in the Apple App Store exceed those in the Play Store, despite the fact that far more apps are downloaded through the Play Store. *See, e.g.,* David Curry, *App Data Report,* BUSINESS OF APPS (2022) at 29 ("Even though Google Play has a larger installed base and 75% of all apps are downloaded on the platform, Apple's App Store leads the way in revenue."). Download statistics differ from consumer expenditure statistics in at least two important ways. *First*, many apps are downloaded free of charge. *Second*, industry data on consumer expenditures aggregates consumer expenditures on initial downloads with consumer expenditures on in-app purchases. *See, e.g., Id*. at 30 (showing aggregate "iOS App and Game Revenues" of $72 billion in 2020); *see also* Sensor Tower, *2021 – 2025 Mobile Market Forecast* (2021) at 36 (also showing a total of $72 billion in 2020 for "App Store Spending" on "Apps" and "Games"; explaining that "[d]riven by the significant success of the *in-app subscription model*, app revenue increased 4.7x between 2016 and 2020, compared to an increase of 2x for games.") (emphasis added). Note also that, based on the

75. Data from industry analysts on mobile app expenditures (which aggregates consumer expenditures on both initial downloads and in-App purchases) confirm (1) that the Play Store and the Apple App Store account for the vast majority of mobile app expenditures outside China; and (2) that the Play Store alone accounts for the vast majority of mobile app expenditures outside China and distinct from iOS. In light of the global dominance of the Play Store and the Apple App Store, industry reports covering mobile apps often focus almost exclusively on these two platforms.[140] But even when other platforms are considered, the data confirm that the Play Store and the Apple App Store account for the vast majority of mobile app expenditures outside of China. For example, global consumer expenditures in Apple's App Store outside of China in 2018 were $32.9 billion,[141] while global consumer expenditures in the Play Store (all of which is outside of China) came to $25 billion in 2018.[142] Global mobile app expenditures outside of China in 2018 were $62 billion.[143] Therefore, outside of China, the Apple App Store and the Play Store accounted for 93.4 percent of global mobile app expenditures as of 2018 (equal to [$32.9 billion + $25.0 billion]/[$62 billion]). Using the same statistics, the Play Store accounted for 85.9 percent of non-Apple mobile app expenditures outside of China in 2018 (equal to [$25.0 billion]/[$62 billion - $32.9 billion]).

76. In 2020, global consumer expenditures in Apple's App Store outside of China came to $52 billion,[144] while global consumer expenditures in the Play Store (all of which is outside of China) came to $39 billion in 2020.[145] Global mobile app expenditures outside of China in 2020 were $95 billion.[146] Therefore, outside of China, the Apple App Store and the Play Store accounted for 95.8 percent of global mobile app expenditures as of 2020 (equal to [$52 billion + $39 billion]/[$95 billion]). Using the same statistics, the Play Store alone accounted for 90.7 percent of non-Apple mobile app expenditures outside China in 2020 (equal to [$39 billion]/[$95 billion - $52 billion]).

77. Similarly, statistics on downloads (as opposed to consumer expenditure) indicate that the Play Store's share of the non-China Android App Distribution Market can be estimated at

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Play Store's financials, [redacted] *See, e.g.*, GOOG-PLAY-010801682 (showing [redacted] of 2021 Play Store revenue coming from Apps and games).

140. *See, e.g.,* Sensor Tower, *Global Consumer Spending in Mobile Apps Reached $133 Billion in 2021, Up Nearly 20% from 2020,* (Dec. 2021), *available at* sensortower.com/blog/app-revenue-and-downloads-2021 (reporting "Global Consumer Spending in Mobile Apps and Games" as the sum of Google Play and the App Store). *See also* David Curry, *App Data Report,* BUSINESS OF APPS (2022); *see also* Sensor Tower, *2019 – 2023 Mobile Market Forecast,* (2019).

141. In 2018, global consumer expenditures reached $47 billion in the Apple App Store. *See* Sensor Tower, *2019 – 2023 Mobile Market Forecast,* (2019) at 4. Consumer expenditures in the Apple App Store in China were $14.1 billion in 2018. *Id.* at 15. Therefore, non-China Apple App Store expenditures in 2018 were $47 billion - $14.1 billion = $32.9 billion.

142. *Id.* at 4.

143. *See* David Curry, *App Data Report,* BUSINESS OF APPS, at 44 (2022) (showing 2018 non-China revenue of $20 billion (United States) + $15 billion (Japan) + $11 billion (Europe) + $16 billion (Rest of World) = $62 billion).

144. In 2020, global consumer expenditures reached $72 billion in the Apple App Store. *See* Sensor Tower, *2021 – 2025 Mobile Market Forecast,* (2021) at 6. Consumer expenditures in the Apple App Store in China were $20 billion in 2020. *Id.* at 22. Therefore, non-China Apple App Store expenditures in 2020 were $72 billion - $20 billion = $52 billion.

145. *Id.* at 6.

146. *See* David Curry, *App Data Report,* BUSINESS OF APPS, 1-69, 44 (2022) (showing 2020 non-China revenue of $32 billion (United States) + $20 billion (Japan) + $14 billion (Europe) + $29 billion (Rest of World) = $95 billion).

over 90 percent:[147] Nearly 60 percent of non-iOS apps downloaded worldwide in 2020 were downloaded through the Play Store,[148] but this estimate vastly understates the Play Store's share of Android downloads, as the denominator includes downloads in China, where the Play Store is blocked. Removing non-iOS downloads in China would likely place the Play Store at over 90 percent of the non-China Android App Distribution Market. For example, if iOS downloads account for one quarter of all mobile downloads in China,[149] then the Play Store's share of the non-China Android App Distribution Market would be 97 percent.[150] Internal Google documents show that, [redacted]

78. With respect to entry barriers, as a two-sided platform, the Play Store benefits from indirect network effects, which serve to entrench its market power;[152] additional Apps attract users, which in turn attract developers, a virtuous cycle that rewards first movers and thwarts later potential entrants. Google [redacted][153] In addition, Google Android's significant share of the number of all mobile devices,[154] means that developers have strong incentives to make their apps Android-compatible to cover the fixed costs of app development. Thus, developers effectively must list their Apps on the Play Store and agree to its restrictive conditions, including the prohibition on steering users to rival app stores. These

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147. As explained above, download statistics differ from consumer expenditure statistics in at least two important ways. *First*, many apps are downloaded free of charge. *Second*, as explained above, industry data on consumer expenditures aggregates consumer expenditures on initial downloads with consumer expenditures on in-app purchases.

148. According to Statista, the total number of app downloads in 2020 was 218 billion, with the Play Store and iOS accounting for 143.2 billion. Statista, *Number of mobile apps downloaded worldwide from 2016 to 2020*, *available at* www.statista.com/statistics/271644/worldwide-free-and-paid-mobile-app-store-downloads/; Statista, *Combined global Apple App Store and Google Play Store app downloads from 1st quarter 2015 to 4th quarter 2021*, *available at* www.statista.com/statistics/604343/number-of-apple-app-store-and-google-play-app-downloads-worldwide/. The Play Store was responsible for 108.5 billion downloads in 2020 and iOS had 34.4 billion, for a total of 142.9 billion. *See* Mansoor Iqbal, *App Download Data (2022),* BUSINESS OF APPS, (Jan. 11, 2022), *available at* www.businessofapps.com/data/app-statistics/ [hereafter *App Download Stats*]. This implies that the Play Store was responsible for 59 percent of the non-iOS downloads worldwide. In 2020, there were 183.6 billion non-iOS downloads (218 billion less 34.4 billion) and 108.5 billion Play Store downloads. Dividing 108.5 by 183.6 yields 0.59.

149. *See* Statista*, Market share of mobile operating systems in China from January 2013 to December 2021**, *available at* www.statista.com/statistics/262176/market-share-held-by-mobile-operating-systems-in-china/ (In October, November, and December of 2021, iOS accounted for 18.99, 19.28, and 21.08 percent of mobile operating systems in China, respectively. In the last quarter of 2021, Apple accounted for approximately (18.99 + 19.28 + 21.08)/3 = 19.8% of mobile operating systems in China.) I conservatively set the percentage to 25 percent for purposes of my calculations here.

150. There were 96.2 billion downloads in China in 2020. *See App Download Stats*, *supra*. Assuming one quarter of those were iOS, then non-iOS downloads in China would be 72.15 billion (equal to 96.2 billion * (1 – 1/4)). Therefore, total worldwide non-iOS downloads outside China would amount to 183.6 billion – 72.15 billion = 111.45 billion. The Play Store share of the non-China Android App Distribution Market would then equal 108.5 billion / 111.45 billion = 0.97.

151. *See* GOOG-PLAY-002076224.R (Google 2019 slide deck titled [redacted] as follows: [redacted] *Id.* at slide 5. Google's analysis also shows that the Play Store accounts for [redacted] *See* GOOG-PLAY-002076224.R at GOOG-PLAY-002076236.R.

152. *See generally* Jean-Charles Rochet & Jean Tirole, *Platform Competition in Two-Sided Markets*, 1(4) EUROPEAN ECONOMIC ASSOCIATION 990-1029 (2003) [hereafter Rochet & Tirole].

153. GOOG-PLAY-000879194.R [redacted] April 2017).

154. *Statista Mobile OS Shares*, *supra*.

restrictions therefore act as substantial barriers to entry for effective competition from rival app stores.

79. The impact of indirect network effects in the Android App Distribution Market is reflected in these statistics: the Play Store offered 3.5 million Apps by the first quarter of 2021,[155] the most of any app store in the Android App Distribution Market. In comparison, the Amazon Appstore offered approximately 460,000 Android Apps.[156] Google [redacted] Users come to Play because we have by far the most compelling catalogue of apps/games. Developers come to Play because that's where the users are."[157] Google also [redacted][158]

80. As discussed more fully in Part III.D.3 below, Google's conduct vis-à-vis developers—including preventing developers from steering users to rival stores and conditioning developers' access to valuable advertising programs on YouTube and Google Search on the sale and distribution of developers' Apps in the Play Store—has substantially foreclosed potential opportunities for alternative app stores to compete with Google, effectively hindering their ability to develop into viable alternative distribution channels for developers. Absent these provisions, developers would have been more inclined to participate in and promote (via steering) alternative app stores, such as those owned by Amazon or LG. Nor has Samsung's Galaxy Store provided effective competition for the Play Store. Although many Android devices come preloaded with both the Play Store and Samsung's Galaxy Store,[159] as explained more fully in Part III.D.2.d below, in part due to Google's conduct, the Galaxy Store has not gained widespread traction with developers;[160] it appears only on Samsung devices, and is thus more limited in reach than the Play Store and [redacted][161]

81. T[redacted] As seen below in Table 1, between 2018 and 2021, the Amazon store was on [redacted] of active devices, and the LG store was on [redacted] of active devices.[162]

155. *See* Statista, *Number of apps available in leading app stores as of 2021*, *available at* www.statista.com/statistics/276623/number-of-apps-available-in-leading-app-stores/.

156. *Id.*

157. GOOG-PLAY-000879194.R at GOOG-PLAY-000879207.R.

158. *Id*. at GOOG-PLAY-000879204.R.

159. Data from GOOG-PLAY-007203253. *See* Table 1, *infra*.

160. *See, e.g.,* Daria Dubrova, *9 Alternative Android App Stores*, THE APP SOLUTIONS, *available at* theappsolutions.com/blog/marketing/alternative-android-app-stores/ ("From the company that manufacturers the most Android phones it is no surprise that Samsung has developed their own app store. Compared to other app stores, Samsung Galaxy Apps has a relatively small number of apps but this can be positive for apps to stand out.").

161. Koh Dep. at 323:3-23 ([redacted].

162. GOOG-PLAY-007203253.

TABLE 1: SHARE OF ACTIVE ANDROID DEVICES WITH ALTERNATIVE APP STORES

Year	Amazon	LG	Galaxy
[redacted]			

Source: GOOG-PLAY-007203253

The economic literature recognizes that evidence of high market shares combined with barriers to entry strongly imply Google's market power in the Android App Distribution Market was sufficient to raise prices above the competitive level.[163] Such evidence is clearly present here.

D. Google's Exclusionary Conduct in the Android App Distribution Market

82. Google's use of various restraints to maintain its dominance in the Android App Distribution Market inhibits competition from rival app stores on mobile devices and from sideloading of direct downloads from developers' websites. Such competition would enable consumers and developers to readily connect to more than one competitive platform, a practice known as "multi-homing." A developer can take advantage of multi-homing by discounting the price of its Apps to "steer" consumers to use the lower-cost platform. Steering and multi-homing combined generally would lower the equilibrium take rate charged by each platform. While Google has claimed openness to other app stores,[164] I next discuss how it has effectively utilized contractual restrictions and revenue-sharing agreements with mobile carriers, OEMs, and developers to restrain competition.[165] I also understand that Professor Schmidt finds that Google imposes overly broad technological barriers that inhibit the installation and usage of alternative app stores on Google Android devices, compared with the Play Store.

163. Large entry barriers tend to eliminate the possibility a competitive fringe can readily and substantially increase production in response to a small increase in the incumbent's price. *See, e.g.,* William Landes & Richard Posner, *Market Power in Antitrust Cases,* 94(5) HARVARD LAW REVIEW 937-996, 947 (1981) [hereafter Landes & Posner].

164. *See, e.g.*, Sameer Samat, *Listening to Developer Feedback to Improve Google Play,* ANDROID DEVELOPERS BLOG, (Sep. 28, 2020), *available at* android-developers.googleblog.com/2020/09/listening-to-developer-feedback-to.html ("We believe that developers should have a choice in how they distribute their apps and that stores should compete for the consumer's and the developer's business. Choice has always been a core tenet of Android, and it's why consumers have always had control over which apps they use, be it their keyboard, messaging app, phone dialer or app store. Android has always allowed people to get apps from multiple app stores. In fact, most Android devices ship with at least two app stores preinstalled, and consumers are able to install additional app stores. Each store is able to decide its own business model and consumer features. This openness means that even if a developer and Google do not agree on business terms the developer can still distribute on the Android platform. This is why Fortnite, for example, is available directly from Epic's store or from other app stores including Samsung's Galaxy App Store.").

165. *See, e.g.*, GOOG-PLAY-003776161.R at GOOG-PLAY-003776176.R ([redacted]).

1. Google's Revenue-Sharing Agreements Eliminated the Threat of Competition from Mobile Carriers

83. Commencing with Google's rollout of the Android operating system, Google prevented competition in the Android universe—and in the creation of rival app stores—through revenue-sharing agreements ("RSAs") with major mobile carriers. [redacted] In 2009, Google recognized that [redacted]

84. Google therefore implemented revenue sharing from the Play Store and other Google properties to neutralize that threat. Google [redacted] until a point where [redacted] Indeed [redacted] By 2010, Google knew that [redacted] Record evidence indicates that Google was aware that most carriers to which [redacted] Google anticipated that its revenue sharing with carriers would [redacted][171] Although the agreements [redacted] are recognized as being anticompetitive under certain conditions.[173] Another potential economic lens with which to assess these payments is a form of predation, which I discuss below.

85. [redacted] In 2009, as part of a broader agreement, Google entered into a revenue-sharing agreement with [redacted] wherein Google agreed to provide [redacted] of each App

166. GOOG-PLAY-001423609.
167. *Id.*
168. GOOG-PLAY-001381141.
169. GOOG-PLAY-004541676 at GOOG-PLAY-004541679.
170. *See* Rosenberg Dep. at 174:3-181:14; GOOG-PLAY4-000339939; GOOG-PLAY-001381054; GOOG-PLAY-001423609.
171. GOOG-PLAY4-000339939; GOOG-PLAY-001423609.
172. *Id.*; *see also* GOOG-PLAY-001423609; GOOG-PLAY-008427238.
173. *See, e.g.*, Kevin Caves and Hal Singer, *On the Utility of Surrogates for Rule of Reason Cases*, CPI ANTITRUST CHRONICLE, (2015); Aaron Edlin, Scott Hemphill, Herb Hovenkamp, and Carl Shapiro, *Activating Actavis*, ANTITRUST, (2013) (explaining how the likelihood that a payment from a branded drug to a generic is anticompetitive increases when the payment exceeds the avoided litigation costs or value of services rendered).
174. GOOG-PLAY-001400503; GOOG-PLAY4-000284361; [redacted]

transaction, while Google retained only [redacted][175] Google continued to pay [redacted] a [redacted] By 2014, [redacted]

86. During 2009 to 2012,[179] when Google was retaining [redacted] of the developers' revenues—and ceding the residual [redacted] of developer revenues to OEMs and mobile carriers—Google was [redacted][180] of operating the Play Store. According to its own financial data, Google's gross profit from the Play Store was [redacted] as late as 2011, and operating profit was [redacted] into 2012.[181] Google's documents indicate that paying carriers [redacted] for distribution of the Play Store would have resulted in [redacted] For instance, an October 2013 presentation indicates that Google's first full year of [redacted] for the Play Store was 2013 and, critically, the gross margin of [redacted] in consumer spend would have [redacted] had Google continued to pay [redacted] to carriers rather than [redacted] (a difference of [redacted]).

175. GOOG-PLAY-001400503 at GOOG-PLAY-001400530 (§ 14.12(b)); GOOG-PLAY4-000284361 at GOOG-PLAY4-000284365.

176. GOOG-PLAY-004542110; GOOG-PLAY-000131205.R at GOOG-PLAY-000131232.R.

177. [redacted]. When Direct Carrier Billing was involved, the carriers received [redacted] of revenue, leaving even less for Google. *See* GOOG-PLAY-004499366 at GOOG-PLAY-004499369 (noting that [redacted]).

178. *See, e.g.* GOOG-PLAY-001886008.R at GOOG-PLAY-001886011.R (s[redacted]); GOOG-PLAY-000131205.R at GOOG-PLAY-000131232.R-GOOG-PLAY-000131233.R [redacted]); GOOG-PLAY-001385324 at GOOG-PLAY-001385345 (2[redacted]).

179. *See* Part III.D.1.

180. Average variable cost refers to variable costs divided by the *total* quantity of output produced. Marginal cost refers to the additional cost incurred by producing *one additional unit* of output. There may be certain variable costs such as customer support that Google incurs when output expands considerably, but that are not incurred when output expands by one unit. Thus, Google's average variable cost will always exceed its marginal cost. Because Google continues to incur expenses at the margin such as processing fees for each sale, its marginal costs are a good approximation of its average variable costs.

181. GOOG-PLAY-000416245 (showing gross profit of [redacted] in and operating profit of [redacted] in 2011. Gross profit is [redacted] in 2012; operating profit is [redacted] in 2012).

[redacted]

[redacted] as it would have been below Google's marginal[182]

87. Based on its financial data, my best estimate is that Google's marginal costs during the period 2016 through 2020 are approximately s[redacted]

88. According to Tom Moss, Google's Head of Japan new business development, Google perceived the Android Market as the [redacted] and the revenue share

182. GOOG-PLAY-004499366 at GOOG-PLAY-004499378.

183. *See* Table 5, *infra* (showing In-App Aftermarket Impact & Damages (8/16/2016 – 12/31/2020). Row 7 calculates marginal cost at [redacted] of consumer expenditures. As explained below, this includes all direct costs of sales and direct operating expenses. If one considers transaction fees in isolation, Google's financial data for the Play Store show that transaction fees alone account for approximately [redacted] of consumer expenditures. *See* Part V.C.1, *infra*. *See also* GOOG-PLAY-000416245.

184. I understand from Plaintiffs' counsel that, as a legal matter, predation does not require pricing to customers below costs, but also can be established via demonstration that payments to *input providers* do not permit rivals to survive. *See* Weyerhaeuser Co. v. Ross-Simmons Hardwood Lumber Co., 549 U.S. 312 (2007) ("A predatory-bidding plaintiff must prove that the predator's bidding on the buy side caused the cost of the relevant output to rise above the revenues generated in the sale of those outputs."). Here, the cost of the relevant output (the cost of operating the Play Store) was approximately eight percent of Google's revenues, which exceeded the revenues generated in the sale of those outputs (five percent) by three percentage points.

as the [redacted][9]

89. Critically important to Google's predatory strategy was to change the rules in the middle of the game, but only after developers were dependent on Google's ecosystem. [redacted] In sum, Google's anticompetitive strategy for securing the Play Store's dominance entailed changing the rules after millions of users, multiple carriers, and multiple OEMs had adopted Google's ecosystem.

90. [redacted]

185. GOOG-PLAY-001423609.
186. *Id.* ([redacted]).
187. GOOG-PLAY-000443763 at GOOG-PLAY-000443772.
188. GOOG-PLAY-000416245.
189. Typically, predation is used to denote charging prices below costs. But the term may also refer to a situation when an input provider (here, the carrier or OEM) is paid so much that an equally efficient rival would not find it profitable to match the payment to the input provider while competing, in which case the payments may drive out equally efficient rivals.
190. GOOG-PLAY-001337211 ("Android: OC Quarterly Review – Q4 2010, Oct 12, 2010") at GOOG-PLAY-001337226.
191. *Id.*
192. *Id.*
193. *Id.*
194. GOOG-PLAY-007264058 at GOOG-PLAY-007264062.

91. [redacted] And Google finally bested [redacted] successfully amending their revenue-sharing agreement in late 2014 to [redacted]

92. [redacted]

93. As explained in Part III.C.2, because the (two-sided) Android App Distribution Market is uniquely characterized by strong indirect network effects, the barriers to entry for a rival app store made for a dangerous probability of [redacted] by Google. Google's control over mobile devices meant that developers had strong incentives to make their apps Android-compatible; additional apps attracted users, which in turn attracted developers—a virtuous cycle that entrants could not exploit, at least in part due to Google's strategy. Indeed, the probability of recoupment was so high that we observe no significant competition in the Android

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195. [redacted]

196. [redacted]

197. [redacted]

198. GOOG-PLAY-003604606 at GOOG-PLAY-003604619. [redacted]

199. GOOG-PLAY-003604601 at GOOG-PLAY-003604603. [redacted]

200. GOOG-PLAY-003605103; GOOG-PLAY4-002178046 at GOOG-PLAY4-002178049; GOOG-PLAY-002891881 at GOOG-PLAY-002891882 ([redacted]).

201. GOOG-PLAY4-004677224 at GOOG-PLAY4-004677225; *see also* GOOG-PLAY-001184813 at GOOG-PLAY-001184823 (2015 internal Google presentation noting [redacted]).

202. GOOG-PLAY-004235359 at GOOG-PLAY-004235360 (emphasis in original).

203. *Id.*

App Distribution Market despite the fact that Google has been [redacted] for almost a decade.

94. In short, once indirect network effects kicked in, granting Google an insurmountable monopoly in the Android App Distribution Market, Google was able to [redacted] without fear of losing market share. As Google executive Jamie Rosenberg later commented: [redacted][204] Economists recognize how much an early, "first-mover" advantage means to incumbents in the context of network effects.[205]

2. Google's Exclusionary Restraints on OEMs

95. I understand that three contracts typically govern the relationship between Google and OEMs. First, OEMs enter Android Compatibility Commitments ("ACCs"), which replaced Anti-Fragmentation Agreements ("AFAs").[206] Broadly speaking, it is my understanding that AFAs and ACCs prevent OEMs from selling any "forked" Android-based devices that do not meet Google's compatibility standards. Provisions in a typical AFA read as follows:

- [redacted]
- [redacted]
- [redacted]

96. Record evidence indicates Google considers forks [redacted] because they could allow third parties to [redacted][8] OEMs must agree to an AFA (or now an ACC) in order to enter into MADAs, discussed in detail in the following subsection. Both are required to gain access to GMS, which has become critical for many apps to function.[209]

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204. GOOG-PLAY-000439987.R at GOOG-PLAY-000440012.R (emphasis added).

205. *See, e.g.*, Agam Gupta et al., *Combating incumbency advantage of network effects: The role of entrant's decisions and consumer preferences*, 20(1) COMPETITION AND REGULATION IN NETWORK INDUSTRIES 3-32 (2019); Marvin B. Lieberman & David B. Montgomery, *Conundra and progress: Research on entry order and performance*, 46 LONG RANGE PLANNING 312–324 (2013), *available at* www.sciencedirect.com/science/article/abs/pii/S0024630113000344?via%3Dihub.

206. GOOG-PLAY-000127155 (Standard AFA Agreement signed by [redacted]); GOOG-PLAY-000808433 ([redacted]); GOOG-PLAY-000808062 ([redacted]); GOOG-PLAY-000808451 ([redacted]); GOOG-PLAY-003604523 ([redacted]); GOOG-PLAY-000416448 ([redacted]).

207. GOOG-PLAY-000127155 (Standard AFA Agreement signed by [redacted]).

208. GOOG-PLAY-001559464 at GOOG-PLAY-001559469.

209. I understand that Professor Schmidt's findings support this conclusion. *See also* GOOG-PLAY-001559473 ([redacted]).

Finally, most OEMs enter into Revenue Sharing Agreement ("RSAs")—whereby Google shares revenue it earns on the device with the OEM.[210]

a. Google's Mobile Application Distribution Agreements Require Distribution and Prominent Placement of The Play Store

97. Google owns some of the most highly valued and widely used Android Apps, including Google Search, Play Store, Maps, Chrome, Gmail, and YouTube. Yet Google refuses to make these apps individually available to OEMs for pre-installation, instead requiring OEMs to pre-install an entire GMS suite or forgo installation of *any* Google proprietary app.[211] It is all or nothing.[212] As explained in the Majority Report of the Congressional Subcommittee on Antitrust, Commercial and Administrative Law:

> Only through Google's licensing agreements can smartphone manufacturers access Google's proprietary apps, such as Gmail, YouTube, Chrome, Google Maps, and Google Play Store. In return, Google requires that certain apps must be pre-installed and must receive prominent placement on mobile devices.[213]

Google recognizes the importance of GMS: [redacted][214]

98. In addition, Google places a number of proprietary APIs in Google Mobile Services. I understand that Professor Schmidt finds that, without access to those APIs, a mobile device will lack access to many commercially important applications. In order to access these critical APIs so that applications can work, and to access certain highly demanded applications, OEMs must sign a MADA with Google to obtain the entire suite of GMS Apps.[215]

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210. *See, e.g.,* GOOG-PLAY-002604372 (July 1, 2020 [redacted] Mobile Revenue Share Agreement).

211. Google's MADA refers to these apps as "Core Applications." *See, e.g.,* GOOG-PLAY-000808375 at GOOG-PLAY-000808377 (2018 [redacted] MADA); GOOG-PLAY-004552342 at GOOG-PLAY-004552344 (2017 Samsung MADA § 1.16 including Search, Chrome, Gmail, Maps, YouTube, and the Play Store). In addition to the "Core Applications," some MADAs require installation of [redacted] GOOG-PLAY-004552342 at GOOG-PLAY-004552344 and GOOG-PLAY-004552347 (§§ 1.15, 3.3). Earlier MADAs defined the applications simply as "Google Applications." *See, e.g.*, GOOG-PLAY-000620996 § 1.1 (2011 Archos S.A. MADA). *See also* Android GMS, *The best of Google, right on your devices*, *available at* www.android.com/gms/.

212. GOOG-PLAY-003776161.R at GOOG-PLAY-003776177.R (discussing MADA as of 2015: [redacted]).

213. Investigation of Competition in Digital Markets: Majority Staff Report and Recommendations, H. SUBCOMM. ON ANTITRUST, COMMERCIAL AND ADMINISTRATIVE LAW OF THE COMM. ON THE JUDICIARY, (Oct. 6, 2020), at 212 [hereafter *Majority Staff Report*]. *See also* GOOG-PLAY-000400751 at GOOG-PLAY-000400773.

214. GOOG-PLAY-001559464.R at GOOG-PLAY-001559471.R. Google recognizes that "[redacted] *Id.*

215. GOOG-PLAY-001559464 at GOOG-PLAY-001559473; *see also* Rosenberg Dep. at 189:24-191:1 (testifying that [redacted]).

99. A typical MADA includes several clauses that require an OEM to give preference to Google Search and other applications in the GMS suite, including the Play Store. GMS Apps must be pre-loaded on devices and prominently displayed on the home screens; Google Search must be the default search engine and must also be given prominent placement.[216] The current MADA also requires OEMs to locate the Play Store on the home screens of each mobile device.[217] If an OEM wishes to install just one App from the GMS suite, the MADA requires that the [redacted] also be installed, and the number of required Google Apps has increased over time.[218] Collectively, all of the Apps in the GMS suite occupy valuable space on each user's mobile device that otherwise could be occupied by competing app stores or other Apps. [redacted] In sum, Google is able to leverage the dominant positions of the Apps in the GMS suite to impose restrictions that are designed to further establish and protect its market power in the Android App Distribution Market.[220]

100. Although Google's MADAs do not prevent OEMs from preloading alternatives to GMS,[221] Google exploits the Play Store's prominent status, which works to the detriment of rival app stores, including any pre-installed near Google's app store.[222] Google's documents recognize

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216. *See, e.g.,* GOOG-PLAY-000025345 at GOOG-PLAY-000025353-GOOG-PLAY-000025354. *See also* GOOG-PLAY-000400751.R at GOOG-PLAY-000400773.R ([redacted]).

217. *See, e.g.*, GOOG-PLAY-004552342 at GOOG-PLAY-004552347 ([redacted]; GOOG-PLAY-000808375 at GOOG-PLAY-000808384 ([redacted]) (2018 MADA (3PL)). [redacted] GOOG-PLAY-000620996 at GOOG-PLAY-000621002 ([redacted]) (2011 MADA between [redacted]).

218. *See* GOOG-PLAY2-000001992 at GOOG-PLAY2-000001995 ([redacted]).

219. *See, e.g.* GOOG-PLAY-004552342 at GOOG-PLAY-004552348 (§ 3.4) ([redacted]); GOOG-PLAY-001404176 (noting that [redacted]).

220. Google's documents establish that the MADA requirements are essential to the Play Store's dominance. GOOG-PLAY-006355073 ([redacted]); GOOG-PLAY-004494430.C at GOOG-PLAY-004494433.C ([redacted]).

221. *See* GOOG-PLAY2-000001992 ([redacted]).

222. Samsung's Galaxy Store is an example of this. As discussed below in Part IV.C., while the Galaxy Store came pre-installed along with the Play Store on the Galaxy S10 and later models, Google has engaged in a course of conduct designed to discourage effective competition to the Play Store from Samsung. [redacted] *See* GOOG-PLAY-000443908 at GOOG-PLAY-000443909. More broadly, multiple studies have shown that defaults can impact consumer decisions towards choices such as retirement savings, energy use, and eating healthier foods. *See* Brigitte C. Madrian & Dennis F. Shea, *The Power of Suggestion: Inertia in 401(k) Participation*

the value of the Play Store's preferential placement on the home screens of mobile devices, including its importance to [redacted] And in questioning whether users and developers would really choose the Play Store, given a choice, a high-level Google employee wrote, [redacted][224]

b. Google Has Deployed Multiple Measures to Ensure That Amazon Would Not Become an Effective Play Store Competitor

101. Google has taken multiple steps to stop competitors from succeeding with a competing app store. Amazon in particular was a potential competitor that has been substantially foreclosed by Google's conduct, which raised the costs to Amazon of competing with its rival app store. *First*, as discussed above, the MADAs mandate installation of the Play Store as a condition of installing any App in the GMS suite. In 2014, Amazon launched a bare Android device called the "Fire Phone," which was not pre-loaded with any of the GMS Apps. Indeed, users were "locked out" by Google from downloading these Apps. Unsurprisingly, consumer demand for a device that cannot include Apps like YouTube, Gmail, or Google Maps was low, and Amazon discontinued the device within a year.[225] The MADAs prevented an OEM from customizing the Apps on mobile devices by precluding an alternative bundle comprised of a rival app store (including Amazon's app store) alongside Google's other popular (non-Play Store) Apps—that is, a rival app store would need to compete across every dimension of Google's app suite at once, effectively raising its costs. Without a successful "Fire Phone" due to Google's restrictions, Amazon was less likely to fully compete in the Android App Distribution Market by investing and developing a mobile app store that would rival the Play Store in scope and reach.[226]

102. *Second,* in 2015 Amazon released a backdoor to the Amazon Appstore (Amazon's App distribution store) through the Amazon App (Amazon's shopping App) that was available for download on the Play Store. As one media outlet noted, "The move effectively turns Amazon's flagship application—an app that has somewhere between 50 million and 100 million installs, according to Google Play's data for the smartphone version—into an app store app that directly

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and Savings Behavior, 116(4) QUARTERLY JOURNAL OF ECONOMICS 1149-1187 (2001); Zachary Brown, Nick Johnstone, Ivan Haščič, Laura Vong, and Francis Barascud, *Testing the effect of defaults on the thermostat settings of OECD employees*, 39 ENERGY ECONOMICS 128-134 (2013); John Peters, Jimikaye Beck, Jan Lande, Zhaoxing Pan, Michelle Cardel, Keith Ayoob, and James O. Hill, *Using Healthy Defaults in Walt Disney World Restaurants to Improve Nutritional Choices*, 1(1) JOURNAL OF THE ASSOCIATION FOR CONSUMER RESEARCH 92-103 (2016).

223. GOOG-PLAY-000832471.

224. GOOG-PLAY-000292207.R at GOOG-PLAY-000292226.R (*see also* GOOG-PLAY-000292207.R at GOOG-PLAY-000292213.R; GOOG-PLAY-006355073).

225. Edelman & Geradin at 167 (citing www.wsj.com/articles/amazon-fire-phone-review-full-of-gimmicks-lacking-basics-1406077565).

226. *See* GOOG-PLAY-001317740 at GOOG-PLAY-001317741 ([redacted]") (emphasis in original); GOOG-PLAY-001451619 (Google negotiators recommend [redacted]); *see also* GOOG-PLAY-007657997 at GOOG-PLAY-007658010 ([redacted]).

competes with Google Play, while also being sold on Google Play."[227] [redacted]

103. *Third*, using its control over access to the GMS suite and the dominant position of the Play Store in the Android App Distribution Market, Google was able to introduce additional restraints that strongly discouraged use of bare Android devices. For example, consumers who had purchased an App via the Play Store were prohibited from re-downloading that App to a bare Android device that could not include the Play Store. These consumers would have to repurchase the same App on their bare device to keep using it.[229] Accordingly, consumers wishing to move to non-Google Android devices, such as the Amazon "Fire" phone, would be required to repurchase all Apps they had previously purchased from the Play Store or contact the developer directly to request a free download on the new device.

c. Google Discouraged Samsung from Effectively Competing with the Play Store in the Distribution of Apps in the Android App Distribution Market and Entered into Deals with Developers to Mitigate the Risk of Competition from Samsung

104. Google's treatment of Samsung, the largest Google Android OEM, illustrates Google's recognition of the potential competitive threat posed by a competing app store and the lengths Google would take to avoid such competition. [redacted]

105. As early as 2011, [redacted]

227. GOOG-PLAY-000832219 at GOOG-PLAY-000832221.

228. [redacted] GOOG-PLAY-000832219 ([redacted]).

229. Edelman & Geradin at 167 (citing www.wsj.com/articles/amazon-fire-phone-review-full-of-gimmicks-lacking-basics-1406077565). The Nokia X phone, also launched in 2014, met a fate similar to the Amazon Fire Phone for these reasons. *Id.*

230. GOOG-PLAY-000004762.R at GOOG-PLAY-000004764.R; *see also* GOOG-PLAY-000367346.R.

231. GOOG-PLAY-006359924 at GOOG-PLAY-006359925 (explaining [redacted]).

232. GOOG-PLAY-006359924.

233. GOOG-PLAY-006359924 at GOOG-PLAY-006359925.

[redacted] or otherwise [redacted]

106. [redacted] To Google, [redacted]

107. [redacted] Specifically, Google offered to [redacted]

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234. GOOG-PLAY-001438299 at GOOG-PLAY-001438300. *See also* GOOG-PLAY-004253884 at GOOG-PLAY-004253907 ([redacted]).

235. GOOG-PLAY-001449339 at GOOG-PLAY-001449340 (explaining [redacted]).

236. GOOG-PLAY-000417080.

237. GOOG-PLAY-001455849 (explaining the [redacted]).

238. *Id*.

239. GOOG-PLAY-001847447 at GOOG-PLAY-001847448 (explaining [redacted]).

240. GOOG-PLAY-004509271 at GOOG-PLAY-004509272.

241. *Id*.

242. *Id*.

243. GOOG-PLAY-000004762 at GOOG-PLAY-000004785. *See also* GOOG-PLAY-000367346.

244. The technical processes known as [redacted] was a critical part of Google's offering. As described by Google, [redacted] meant that Google [redacted] GOOG-PLAY-000464148 at GOOG-PLAY-000464150. It would also [redacted] *Id*. In practical terms, that meant Google would [redacted] *Id*. at GOOG-PLAY-000464149-GOOG-PLAY-000464150.

[redacted]

108. [redacted]

109. [redacted]

- [redacted]
- [redacted]
- [redacted]

d. Google Project Hug Secured Content from Some of the Largest Developers, Preventing them from Giving Competing Stores the Exclusive Content Necessary to Help Drive Usage

110. [redacted] Known internally as the [redacted] thereby foreclosing the ability of developers [redacted] Google's [redacted]

245. GOOG-PLAY-000367346.R at GOOG-PLAY-000367347.R.
246. Rosenberg Dep. at 114:24-115:22; *see also* PX 783, GOOG-PLAY-007384816 at GOOG-PLAY-007384818.
247. GOOG-PLAY-001877016 at GOOG-PLAY-001877020–GOOG-PLAY-001877021.
248. *Id*. at GOOG-PLAY-001877020.
249. *Id*.
250. GOOG-PLAY-001877016 at GOOG-PLAY-001877019.
251. GOOG-PLAY-000000807 at GOOG-PLAY-000000810.
252. GOOG-PLAY-000464148 at GOOG-PLAY-000464151.
253. *Id*.

111. [redacted]

112. [redacted]

113. While Google [redacted]

114. Google's subsequent analysis of a major game release, [redacted] confirmed the Update's findings and estimated the [redacted] (across all apps), or between [redacted] of the amount consumers spent on the same Apps on the Play Store.[262] Thus, [redacted]

254. Koh Dep. at 362:22-363:1.
255. *Id*. at 364:13-365:4.
256. *Id*. at 367:4-16.
257. GOOG-PLAY-002994573 at GOOG-PLAY-002994574.
258. GOOG-PLAY-004136427.
259. GOOG-PLAY-000443908.R at GOOG-PLAY-000443911.R.
260. *Id.* at GOOG-PLAY-000443909.R. The same document presents store engagement metrics indicating that [redacted] *Id.* at 913 ([redacted]).
261. GOOG-PLAY-000367346.R at GOOG-PLAY-000367351.R.
262. GOOG-PLAY-000001317. In a 2019 internal email referencing "top games" such as [redacted], Google's Christian Cramer asked, [redacted]

[redacted]

e. Google's New Revenue Sharing Agreements With OEMs Are Designed To Further Entrench The Play Store's Monopoly

115. Google has further insulated the Play Store from competition through its most recent series of OEM agreements. Stylized as [redacted]

116. [redacted]

117. [redacted][268] In 2020, based on projections for [redacted] who had then signed [redacted] agreements, Google anticipated over [redacted] devices to ship in [redacted].[269] According to Google's internal estimates, as of J[redacted] and this was expected to [redacted]

[redacted] *Id.* More broadly, the same document also estimated that aggregate consumer spend for Apps and Games ("A&G") in the Galaxy Store was about [redacted] of those in the Play Store. *Id.* at 317 ("Galaxy Store grosses [redacted] today in A&G consumer spend (between [redacted] of Play A&G spend[.]").

263. *See* GOOG-PLAY-004489416.R; GOOG-PLAY-000443763; GOOG-PLAY-004494430.C; GOOG-PLAY-004486928.R.

264. GOOG-PLAY-000443763 at GOOG-PLAY-000443773.

265. *Id*. at GOOG-PLAY-000443775.

266. GOOG-PLAY4-007239946.

267. *Id*.

268. GOOG-PLAY-000620210 ([redacted]); GOOG-PLAY-000620638 ([redacted]); GOOG-PLAY-005706338 ([redacted]); GOOG-PLAY-008111867 ([redacted]); GOOG-PLAY-001745614 ([redacted]); GOOG-PLAY-000416708 ([redacted]); GOOG-PLAY-000620282 ([redacted]); GOOG-PLAY-000620442 ([redacted]); GOOG-PLAY-000620131 ([redacted]); GOOG-PLAY-005706436 ([redacted]); GOOG-PLAY-005706676 ([redacted]); GOOG-PLAY-007038477 ([redacted]); GOOG-PLAY-007038511 ([redacted]); GOOG-PLAY-000620478 ([redacted]); GOOG-PLAY-005706728 ([redacted]); GOOG-PLAY-000416651 ([redacted]).

269. GOOG-PLAY-008006134.

[redacted][270] For some OEMs, all or nearly all of their devices sold in [redacted] were "[redacted] demonstrating the power of Google's revenue sharing terms.[271]

118. The RSA agreements substantially foreclose some of the remaining and most viable distribution avenues for competitive stores. For these agreements, Google targeted those groups of OEMs that were [redacted][272] "Prioritizing Play" meant preloading [redacted][273] As of 2019, Google's plan was to move "all current non-Samsung RSA partners" to its RSA agreements.[274] Google's internal documents indicate that it focused on [redacted] hese new, broad restrictions on potential third-party competitors serve to further entrench the Play Store's dominance.

3. Google's Exclusionary Android App Distribution Market Restraints on App Developers

119. Google's agreements with developers inhibit competition from rivals in the Android App Distribution Market by prohibiting the distribution of competing app stores through the Play Store and by prohibiting developers from steering users to lower-priced App distribution channels or using user information learned through the Play Store. Developers are precluded from using the Play Store "to distribute or make available any Product that has a purpose that facilitates the distribution of software applications and games for use on Android devices outside of Google Play."[276] Nor can developers steer consumers to other platforms or websites to purchase or download Apps or In-App Content: "You may not use user information obtained via Google Play to sell or distribute Products outside of Google Play."[277]

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270. GOOG-PLAY-003894142 at GOOG-PLAY-003894172. I understand that Plaintiffs do not have updated discovery from Google to determine the number of current devices that ship under [redacted] terms.

271. *Id.* at GOOG-PLAY-003894173 (noting [redacted] for [redacted] for [redacted], and [redacted] for [redacted]).

272. *See* GOOG-PLAY-000443763 at GOOG-PLAY-000443774.

273. *Id.* at GOOG-PLAY-000443775.

274. GOOG-PLAY4-007239946 at GOOG-PLAY4-007239947.

275. GOOG-PLAY-004502766.

276. *See* Google Play Developer Distribution Agreement (as of Jan. 4, 2014) ("You may not use the Market to distribute or make available any Product whose primary purpose is to facilitate the distribution of software applications and games for use on Android devices outside of the Market."); Google Play Developer Distribution Agreement (as of Sep. 25, 2014) ("You may not use the Store to distribute or make available any Product which has a purpose that facilitates the distribution of software applications and games for use on Android devices outside of the Store."); Google Play Developer Distribution Agreement (effective as of June 12, 2020) ("You may not use Google Play to distribute or make available any Product that has a purpose that facilitates the distribution of software applications and games for use on Android devices outside of Google Play."). [redacted] *See, e.g.*, GOOG-PLAY-000054021 at GOOG-PLAY-000054022; GOOG-PLAY-000054683 at GOOG-PLAY-000054685 ([redacted] Compare GOOG-PLAY-000054039 at GOOG-PLAY-000054041 (2014 version) with GOOG-PLAY-000053975 at GOOG-PLAY-000053977 (2017 version).

277. GOOG-PLAY-000053875 at GOOG-PLAY-000053876 (Google Play Developer Distribution Agreement (effective as of Nov. 17, 2020), point 4.9).

120. In addition, to access Google's App Campaigns program, Android App developers must list their Apps in the Play Store.[278] Only Apps that were distributed in the Play Store could participate in Google's App Campaign program, a program specifically designed to allow developers to place ads for Apps and In-App Content on Google's self-proclaimed most valuable properties.[279] Those "properties," which are specially optimized for the advertising of mobile Apps, included Google Search, YouTube, Discover on Google Search, and the Google Display Network. Google was explicit about this linkage in its marketing, representing that placement in the Play Store enabled developers to "get your app into the hands of more paying users" by "streamlin[ing] the process for you, making it easy to promote your apps across Google's largest properties."[280] This conduct further entrenched Google's monopoly in the Android App Distribution Market by coercing developers to list their Apps in the Play Store or risk losing advertising access to some of the Internet's most effective advertising space.

121. [redacted]

122. [redacted]

278. Google Ads Help, *About App campaigns, available at* support.google.com/google-ads/answer/6247380?hl=en.

279. *See* GOOG-PLAY-000226999 at GOOG-PLAY-000226999-GOOG-PLAY-000227001 (Co-marketing fund agreement) ([redacted]).

280. Google Ads Help, *About App campaigns, available at* support.google.com/google-ads/answer/6247380?hl=en.

281. GOOG-PLAY-000445443.R at GOOG-PLAY-000445458.R. Externally, in negotiations with developers, Google referred to Project Hug as the "Games Velocity Program" ("GVP"). *See* GOOG-PLAY-000932349. Google required developers who signed GVP agreements to [redacted] *Id.* at GOOG-PLAY-000932352 ([redacted]).

282. Another important component of Project Hug was Google's effort to limit the ability of [redacted] GOOG-PLAY-000000807. Indeed, it is noteworthy that Google's Business Council simultaneously approved Project Hug and efforts to [redacted] *Id.* at GOOG-PLAY-000000808. In support of this endeavor, Google would offer Samsung [redacted] *Id.* at GOOG-PLAY-000000809. In return, [redacted] *Id.* at GOOG-PLAY-000000810-GOOG-PLAY-000000811. [redacted]

283. *See, e.g.,* GOOG-PLAY-000559379 at GOOG-PLAY-000559382 and GOOG-PLAY-000559384; GOOG-PLAY-000000807; GOOG-PLAY-000229696; GOOG-PLAY-005027813 ([redacted]

[redacted]

123. [redacted] requirement in particular proved successful. Within one year, [redacted] According to Google, if [redacted][288] Google, aiming to [redacted] defection from Google Play, made an offer to [redacted] that involved r[redacted][289] By [redacted] Google had offered [redacted][290] Shortly thereafter, [redacted][291]

124. Altogether, [redacted] while also driving an additional [redacted] in cross-platform revenue.[292] Google also noted that [redacted][93] In [redacted] to double down and [redacted]

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developers and their expected 2020 Play spend, along with [redacted]

284. GOOG-PLAY-000559379 at GOOG-PLAY-000559382-GOOG-PLAY-000559383 ("In a typical deal, Play [redacted] *See also* GOOG-PLAY-004119228.R at GOOG-PLAY-004119237.R ("[redacted]").

285. GOOG-PLAY-000000807 at GOOG-PLAY-000000810-GOOG-PLAY-000000811.

286. GOOG-PLAY-000001976.

287. *Id.* ([redacted]).

288. GOOG-PLAY-000003283.R at GOOG-PLAY-000003308.R.

289. GOOG-PLAY-000001976 at GOOG-PLAY-000001976-GOOG-PLAY-000001977 ([redacted]).

290. GOOG-PLAY-000003283.R at GOOG-PLAY-000003286.R.

291. GOOG-PLAY-003899355.R at GOOG-PLAY-003899360.R.

292. GOOG-PLAY-004146689.R at GOOG-PLAY-004146697.R.

293. *Id.*

294. GOOG-PLAY-004146689 at GOOG-PLAY-004146722.

125. Google's [redacted] requirement that [redacted] can be understood as a most-favored-nations ("MFN") clause foreclosing competing app stores from entering into exclusive arrangements with developers whereby, in return for a substantial payment, the developers agree to launch a title on a rival app store. When employed by dominant platforms such as Google, MFNs have been recognized as impairing competition.[295] Pricing-parity MFNs preclude the supplier (developer) from pricing below the price it charges on the platform,[296] but MFNs can also dictate non-price terms such as product quality or timing that indirectly weaken price competition. Baker and Scott Morton explain that "[p]latform MFNs with greater scope and duration would be expected to have stronger anticompetitive effects and impose larger penalties[.]"[297] The scope of Google's equivalent to an MFN here can be measured by the revenue-share of the participating Apps among U.S. customers. [redacted]

126. [redacted] For this reason, Mr. Koh [redacted][301]

127. Google's [redacted]

295. *See, e.g*, Jonathan B. Baker & Fiona Scott Morton, *Antitrust Enforcement Against Platform MFNs*, 127(7) YALE LAW JOURNAL 2176-2202, 2177 (2017) (studying the effects of MFNs under an "agency distribution model," whereby "the platform does not take ownership of the good (*e.g.*, the hotel room) but sells it on behalf of the owner at a price chosen by the owner.").

296. A pricing-parity requirement creates an incentive for the seller not to offer low prices because any price discount must be offered to all covered buyers, which makes discounting more expensive and thus softens price competition. *Id*. at 2179-2180.

297. *Id*. at 2182.

298. List taken from GOOG-PLAY-000237798. [redacted] is excluded from this list. GOOG-PLAY-000001976 ([redacted]).

299. The Project Hug developer list was taken from GOOG-PLAY-000237798, with [redacted] excluded, *supra*. The expanded GVP developer list is taken from GOOG-PLAY-004146689 at GOOG-PLAY-004146710.

300. Koh Dep. at 364:9:365:4.

301. *Id*. at 367:4-16.

[redacted]

4. Technical Barriers

128. I understand that Professor Schmidt finds that Google uses various technical barriers that prevent or inhibit competition from other app stores with its Play Store. Google makes it unnecessarily difficult for consumers to download Apps from rival app stores. I understand Professor Schmidt explains that, in many cases, users must first locate the store on the Internet, then sideload the store, and then change a security setting on Android devices, which Google discourages by first creating default settings that block these downloads, and then, if the user attempts to change the setting to download an application, by displaying often misleading warnings regarding competing app stores.

129. For example, [redacted][302] The "Unknown Sources" label is ominous, with early versions warning users that downloading app stores would make your "[p]hone and personal data … more vulnerable to attack."[303] Android has used variations of this warning even for reputable stores like Amazon's.[304] I understand that Google has continued to use such warnings when a user attempts to install rival app stores.

130. I understand that Professor Schmidt finds that Google further frustrates the ability of consumers to customize their devices by imposing technical barriers that impact the downloading of Apps from outside the Google Play Store, including from developer websites, which must proceed through an "unknown sources" flow. While Google Android technically permits sideloading, I understand that Professor Schmidt will opine that Google has made it unnecessarily cumbersome. I also understand that the Google, over time, has increased the frequency with which a user encounters the "unknown sources" flow. In the past, a user would trigger the "unknown sources" flow when downloading a third-party app store, but not when thereafter downloading an app from that third-party app store. Now, a user triggers the "unknown sources" flow when downloading the third-party app store *and* when downloading the user's first app. As a result of these technical impediments, sideloading is not a commercially viable alternative distribution channel for most developers.[305]

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302. [redacted] GOOG-PLAY-000297309.R at GOOG-PLAY-000297311.R-GOOG-PLAY-000297314.R. I understand that this is confirmed by Professor Schmidt's findings.

303. Blake Stimac, *How to sideload an app onto your Android phone or tablet*, GREENBOT, (July 17, 2014), *available at* www.greenbot.com/article/2452614/how-to-sideload-an-app-onto-your-android-phone-or-tablet.html.

304. Jimmy Westenberg, *How to install the Amazon Appstore on your Android [Android 201]*, ANDROIDGUYS, (Apr. 5, 2014), *available at* www.androidguys.com/tips-tools/install-amazon-app-store-android/.

305. *See also* Jerry Hildenbrand, *Sideloading and Unknown Sources on Android: How to do it and fix errors*, ANDROID CENTRAL, (Apr. 16, 2020), *available at* www.androidcentral.com/unknown-sources ; Edelman & Geradin , *supra*, at 168 ("enabling sideloading requires first reducing phone security settings, which users will rightly hesitate to do."); Joel Snyder, *What are the risks of sideloaded Android applications?*, SAMSUNG KNOX, (Apr. 20, 2020), *available at* www.samsungknox.com/en/blog/what-are-the-risks-of-sideloaded-android-applications ; Dallas Thomas, *Get Easy Updates on Sideloaded Android Apps*, GADGET HACKS, (Dec. 27, 2016), *available at* android.gadgethacks.com/how-to/get-easy-updates-sideloaded-android-apps-0174291/.

131. In addition, I understand that Professor Schmidt will explain that Google has also historically restricted auto-updating capability to Apps listed in the Play Store or app stores pre-installed by OEMs. (Auto-updating is properly understood as a function in the Android App Distribution Market; there is no separate demand among consumers for that function apart from an app store.) This restriction inhibits competition by degrading the user experience for Apps downloaded from an alternative source. I understand that Professor Schmidt will set forth that Google only recently loosened this restriction when it released Google Android version 12 in October 2021.[306]

IV. GOOGLE'S ANTICOMPETITIVE CONDUCT IN THE IN-APP AFTERMARKET OF SERVICES IN SUPPORT OF THE PURCHASE OF IN-APP CONTENT

132. In this Part, I use data, economic methods, and evidence common to all Class members to establish that the global In-App Aftermarket for services in support of the purchase of In-App Content is a relevant market for antitrust purposes, that Google possesses significant market power in this market, and that Google has engaged in anticompetitive conduct to further and retain its power in this market.

A. The In-App Aftermarket Is a Distinct Relevant Antitrust Product Market

133. After a consumer has examined the available options on the Play Store, selected an App, and downloaded it to her device, the developer may choose to offer In-App Content for purchase and download. Such content can include, among others, access to an ad-free version of the App; videos or interactive programs that run within the App; or avatars, skins, or other accessories used for in-App gameplay. When Apps are free, the sale of In-App Content is often a major way for developers to earn revenue. Indeed, r [redacted][307]

134. I understand that to provide In-App Content, developers must be able to authorize the use of such content and collect payment from consumers for it. Payment systems require software that securely verifies and accepts customer purchases and may perform other related functions such as storing information about users and their purchasing history or tracking payment histories. Payment systems are also keyed to trigger the unlocking and authorization for the delivery of In-App Content once it is purchased and paid for by consumers. That is, distribution of In-App Content is not complete until the consumer can use those items, and that does not occur until payment is processed and the feature is unlocked.[308]

135. The Play Store is not needed in these In-App Aftermarket services, as the matchmaking function is not present. Thus, the one-sided In-App Aftermarket is distinct from the two-sided Android App Distribution Market. *See* Part III.A, *supra.* As Mr. Koh testified, [redacted][309] Although (by virtue of the billing system tie-in) Google provides

306. *See also* Google Play services, *available at* developer.android.com/distribute/play-services ; GOOG-PLAY-004904016.

307. GOOG-PLAY-000379093.

308. I understand that Professor Schmidt's findings support this conclusion.

309. Koh Dep. at 381:4-382:6.

confirmation of payment, it is the developer, and not Google, that releases and delivers In-App Content to the consumer.[310] I also understand that Professor Schmidt finds that, as a technological matter, there is no basis for Google to insert itself into the In-App Aftermarket by requiring that developers use Google Play Billing.

136. In Appendix 5, I use a critical-loss analysis to inform a SSNIP test, which shows that a hypothetical monopoly provider of In-App Aftermarket services could profitably raise prices above competitive levels demonstrating that the In-App Aftermarket is a separate relevant antitrust product market.

137. Google uses its contracts with developers to control the In-App Aftermarket. Initially, Google requires that, if an App is offered through the Play Store, the developer must use Google Play Billing for all subsequent sales of digital In-App Content that is consumed within the App.[311] Google utilizes Google Play Billing to impose a general take rate of 30 percent (with the aforementioned exceptions)—the same take rate it commands in the Android App Distribution Market—on all such purchases in perpetuity.[312]

138. Absent Google's restrictions, competition would materialize and there would be alternative providers of In-App Aftermarket services, including authorization and payment systems. And record evidence shows that developers (the buyers in the In-App Aftermarket of services in support of consummating a purchase of In-App Content) seek those services from third parties,[313] consistent with the notion of a *separate demand* from the matchmaking service offered via the app store in the Android App Distribution Market. The developer's demand for those services is derived from the consumer's demand for In-App Content. That numerous major developers have gone to the effort to use other systems, and to steer users to those systems (see Part IV.C.1 below), provides economic evidence that there is a market demand for the In-App Aftermarket services separate from the matchmaking services provided in the Android App

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310. *Id*. at 383:3-21.

311. Google Developer Program Policy (effective Dec. 1, 2021), *available at* support.google.com/googleplay/android-developer/answer/11498144?hl=en&visit_id=637814760589469507-2803788482&rd=1. *See also* my discussion earlier in Part I.A.2.

312. *See* Google Play, *Google Play has something for everyone, available at* play.google.com/about/howplayworks/?section=about-google-play&content=service-fee. The service fee applies if developers "sell subscriptions or other digital content within an app," but is not affected by the length of time after an App is downloaded – with the exception of subscription products, which face a lower service fee after being retained for over a year. *See* Play Console Help, *Service fees*, *available at* support.google.com/googleplay/android-developer/answer/112622?hl=en.

313. *See, e.g.*, Koh Dep. at 183:14-18 ([redacted]; Deposition of Kevin Wang (Dec. 15, 2021) at 94:14-21 ([redacted]). *See also* GOOG-PLAY-000259276 ([redacted]); GOOG-PLAY-004703579 at GOOG-PLAY-004703584 ([redacted]); GOOG-PLAY-004716632 ([redacted]); GOOG-PLAY-004721177 ([redacted]); GOOG-PLAY-006817773.R at GOOG-PLAY-006817802.R ([redacted]).

Distribution Market.[314] Potential competitors include the major payment systems now used for online Internet purchases, such as credit and debit card networks, PayPal, distribution and payment systems used by other app stores, or developers themselves. I understand that Professor Schmidt finds that the software required for authorization and payments is already widely accessible and used for many online transactions and could readily be adapted to effectuate the purchase of Android In-App Content. Google froze out competitors by requiring that all developers use Google Play Billing, Google's own services for the fulfillment and consummation of transactions for all In-App Content purchased in Apps that were downloaded from the Play Store. Notably, in discussions with , Google had considered a scenario in which [315]

139. Google's prohibition of developer steering of consumers to outside authorization and payment channels indicates that third-party providers could replicate Google's authorization and payment channel for In-App Content, and that there is a separate demand for those services.[316] Google's internal documents recognize that developers [318]

140. Multiple internal analyses conducted by Google evidence that it considered One 2019 presentation contemplates that Google could [319] Likewise, a 2021 Google analysis titled [320] Google's internal analyses of competition among Google Play Billing and alternatives demonstrate These competitive analyses further demonstrate that

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314. Although Google may have security justifications for approving distribution methods of In-App Content, this can easily and less restrictively be accomplished by white-listing developers, a process that Google already conducts for OEMs, and by providing developers with certificates approving their security so that developers can use them with other payment processors.

315. GOOG-PLAY-005653612.R at GOOG-PLAY-005653617.R).

316. Google uses the Google Play Billing Library API to facilitate the selling of In-App Content**.** *See* Google Play Billing, *available at* developer.android.com/distribute/play-billing.

317. See, e.g., GOOG-PLAY-000258923 ( ); GOOG-PLAY-000840773 at GOOG-PLAY-000840774 ( ); GOOG-PLAY-003334312 at -316 ( ); GOOG-PLAY-004470512 at GOOG-PLAY-004470513 (from testing

318. GOOG-PLAY-000259276 at GOOG-PLAY-000259277.

319. GOOG-PLAY-000542516.R at GOOG-PLAY-000542532.R ( ).

320. GOOG-PLAY-007745829 ( ).

141. Further, Google's documents recognize the possibility that [redacted][321]

142. Google's efforts to prevent selected developers from circumventing Google Play Billing and using alternative means of authorization and payment processing for In-App Content is yet additional evidence that there are actual or potential competitors to Google's services for these items, and thus that there is a separate and distinct In-App Aftermarket. Google's documents also provide evidence that, without its contractual restrictions, Google's take rate for In-App Content would fall. [redacted][22] This exercise demonstrates that Google recognized that authorization and payment processing for In-App Content is distinct from what it provides through the Play Store.

B. The Relevant Geographic In-App Aftermarket Is Global (Excluding China)

143. The geographic market for the In-App Aftermarket is also global (excluding China). If Google's restrictions were not in place, it would not require any increase in Google's current take rates to attract entrants from other countries into the In-App Aftermarket. [redacted][323] Thus, the geographic In-App Aftermarket is not limited solely to the United States but is worldwide (excluding China).

C. Google's Market Power in the In-App Aftermarket

144. As with the Android App Distribution Market, I assess Google's power in the In-App Aftermarket through direct proof of firm-specific measures that speak directly to a firm's ability to profitably raise prices.[324] In Part V.C below, I show that Google would be forced to reduce its take rate in the In-App Aftermarket absent its restraints, which is also direct evidence of

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321. GOOG-PLAY-004564758. [redacted] *Id.* at GOOG-PLAY-004564761. [redacted] *Id.* This is a similar anticompetitive theory of harm as that pursued by the Department of Justice (DOJ) in the *Microsoft* antitrust litigation, in which the dominant operating system tied its browser to its operating system with the alleged aim of preventing a rival browser from evolving into a full-bore competitor for Microsoft's operating system (or what the DOJ called "middleware").

322. GOOG-PLAY-006829073 ([redacted]).

323. [redacted]

324. Herbert Hovenkamp, *Digital Cluster Markets*, COLUMBIA BUSINESS LAW REVIEW 1-30 (forthcoming 2022), at 24 ("By contrast, 'direct' proof relies on estimates of firm elasticity of demand, evidenced mainly by a firm's price-cost margins or output responses to price changes.[] These methodologies are capable of giving more accurate measures of market power as it is best defined, which is the ability of a firm to profit by raising its price above its costs.[]"); *see also* Louis Kaplow, *Why (Ever) Define Markets?,* 124 HARVARD LAW REVIEW 437 (2010).

its market power. That Google is able to impose restrictions on developers that exclude competition also evidences Google's power. I also examine indirect evidence—market shares and entry barriers—to establish that Google has market power in the In-App Aftermarket. My assessment of both direct and indirect evidence relies entirely on data and methods that are common to the Class.

1. Direct Evidence

145. Google's 30 percent standard take rate for initial downloads and purchases of In-App Content is direct evidence of its market power in the In-App Aftermarket. In the Android App Distribution Market, the Play Store brings together consumers and developers in a matchmaking role, though in many cases the consumer would be aware of the App she sought before searching for it in the Play Store, suggesting a more modest contribution by Google to value added.[325] In contrast, there is no matchmaking role in the purchase of In-App Content or for the services in support of consummating those purchases in the In-App Aftermarket.

146. Because Google as an intermediary provides additional value in the Android App Distribution Market via matchmaking, one would expect that, as in competitive markets where the take rate reflects the value added by the intermediary, the take rate in the Android App Distribution Market would exceed any take rate in the In-App Aftermarket. That Google's take rate—a price that presumably reflects its value-added to the transaction—is the same for initial downloads and purchases of In-App Content made even five years later strongly suggests that Google has anticompetitively extended its market power from the Android App Distribution Market into the In-App Aftermarket.

147. Indeed, a Google document shows that its elevation of take rates over competitive levels is substantially profitable, suggesting that Google possesses market power. In a 2020 business strategy document recommending [redacted] (in other words, in the In-App Aftermarket), Google [redacted]

325. Google's documents provide evidence that [redacted] GOOG-PLAY-007317574 at GOOG-PLAY-007317585. A 2020 presentation reviews survey results showing that [redacted] *Id.* at GOOG-PLAY-007317584. [redacted] *Id.* at GOOG-PLAY-007317591.

326. GOOG-PLAY-006990552 at GOOG-PLAY-006990553.

327. *Id.* ([redacted]).

328. *Id.* ([redacted]).

148. Google's ability to price discriminate also evidences its market power. Basic economic principles tell us that "[f]or a firm to price discriminate, it must have some market power."[329] In a document titled [redacted] Google recognized that [redacted][334] Google has also cut in half the take rate for subscriptions, which are not limited to mobile devices; for subscriptions the platform is not as important, and they could command a lower rate. That Google is able to cut special deals below its standard 30 percent take rate for developers with recurring subscriptions or with streaming Apps with large content costs[335] is also consistent with Google having market power. A firm that lacks market power would not enjoy the privilege of discriminating across customer types according to their willingness or ability to pay, but instead would be forced to charge a uniform price at competitive levels.

2. Indirect Evidence

149. Ninety-seven percent of all developers offering apps through the Play Store currently use Google Play Billing, and a September 2020 announcement by Google indicates that it intended to capture the remaining three percent.[336] Google announced that it would fully enforce its contractual restrictions that require developers to use only Google Play Billing for all purchases of In-App Content. As a result, developers cannot use their own methods of authorization and payment processing services or contract for them through third parties. Alternative providers are

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329. N. GREGORY MANKIW, PRINCIPLES OF MICROECONOMICS 303-304 (Cengage Learning 8th ed. 2018) [hereafter MANKIW] ("price discrimination is not possible when a good is sold in a competitive market"; "For a firm to price discriminate, it must have some market power.").

330. GOOG-PLAY-007329063.

331. *Id*. at GOOG-PLAY-0079066.

332. *See* Defendants' Answers and Objections to Developer Plaintiffs' First Set of Interrogatories to Defendants (July 6, 2021) at 13-16. *See also* Google Play Console, *Play Media Experience Program*, available at play.google.com/console/about/mediaprogram/.

333. GOOG-PLAY-000259276 at GOOG-PLAY-000259277 ([redacted]).

334. GOOG-PLAY-006381385 at GOOG-PLAY-006381387.

335. *See, e.g.,* Kif Leswig, *Bumble, Duolingo lead rally in shares of app developers after Google slashes subscription fees*, CNBC (Oct. 21, 2021), *available at* www.cnbc.com/2021/10/21/google-cuts-app-store-fees-lifting-shares-of-app-developers.html.

336. Google - Android Developers Blog, *Listening to Developer Feedback to Improve Google Play* (Sept. 28, 2020), *available at* android-developers.googleblog.com/2020/09/listening-to-developer-feedback-to.html ("Again, this isn't new. This has always been the intention of this long-standing policy and this clarification will not affect the vast majority of developers with apps on Google Play. Less than 3% of developers with apps on Play sold digital goods over the last 12 months, and of this 3%, the vast majority (nearly 97%) already use Google Play's billing. But for those who already have an app on Google Play that requires technical work to integrate our billing system, we do not want to unduly disrupt their roadmaps and are giving a year (until September 30, 2021) to complete any needed updates. And of course we will require Google's apps that do not already use Google Play's billing system to make the necessary updates as well.").

totally foreclosed from the In-App Aftermarket. Google's requirement that developers of Apps marketed through the Play Store in the Android App Distribution Market exclusively use Google Play Billing for all purchases of In-App Content serves as an artificial barrier to entry in the In-App Aftermarket. Absent the restraint, many providers would step forward to provide competitive payment processing and authorization of In-App Content.

D. Google's Anticompetitive Exclusionary Conduct in the In-App Aftermarket

150. Google has maintained multiple restrictions affecting the In-App Aftermarket. These fall into three mutually reinforcing categories. By contract, Google conditions the right to distribute an App downloaded through the Play Store on a developer's agreement to exclusively use Google Play Billing for all subsequent sales of In-App Content.[337] Google contractually requires developers to pay Google a set take rate (generally at 30 percent) for every purchase of In-App Content made through their Apps in perpetuity. Put differently, Google enforces this condition by requiring the developer to use Google Play Billing for all payments of In-App Content within the App forever and at the same take rate it commands in the Android App Distribution Market.[338] If a consumer downloads an App via the Play Store, the developer is charged a commission for any purchases made within the App, even long after the Play Store performed its initial matchmaking and distribution function. Thus, Google has extended its monopoly power in the Android App Distribution Market to insert itself into the separate In-App Aftermarket by requiring developers to exclusively use Google Play Billing for authorization and payment services in support of the purchase of In-App Content and to pay Google a take rate on those purchases (usually 30 percent), which can economically be characterized as a "tie-in."

151. Google also contractually prohibits developers from steering customers to alternative authorization and payment processing outlets for purchasing In-App Content outside the Play Store, including the developer's web site or alternative suppliers of payment processing and other services in the In-App Aftermarket.[339] And Google even prohibits the developer from using any consumer information learned through the Play Store. These restraints constrain an App's steering to lower-cost alternatives via browser-based payment options such as "in-app web views, buttons, links, messaging, advertisements, or other calls to action."[340]

152. In contrast, other app stores allow developers the ability to select their providers of payment systems for purchases of In-App Content at lower take rates than Google imposes. For example, Aptoide imposes a ten percent take rate for purchases of In-App Content if the user

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337. Google – Play Console Help, *Developer Program Policy* (effective December 1, 2021), *available at* support.google.com/googleplay/android-developer/answer/11498144?hl=en&visit_id=637814760589469507-2803788482&rd=1. *See also* my discussion earlier in Part I.A.2.

338. *See* Google - Play Console Help, *Service fees*, *available at* support.google.com/googleplay/android-developer/answer/112622?hl=en. The service fee applies if developers sell subscriptions or other digital content within an app, but is not affected by the length of time after an app is downloaded – with the exception of subscription products, which face a lower service fee after being retained for over a year.

339. Google Developer Program Policy (effective March 1, 2021), *available at* support.google.com/googleplay/android-developer/answer/9934569?hl=en&ref_topic=9877065#zippy=%2Cmarch; *see also* GOOG-PLAY-000225435 ("it's against policy to direct users to content outside of the Play Store (including to 3rd party websites offering rewards").

340. *Id.*

downloads the app using the developer's own URL.[341] The One Store in South Korea imposes a five percent commission for developers that do not use the One Store billing system.[342]

1. Google's Contractual Provisions with Developers Enable Google To Maintain Its Dominance in the In-App Aftermarket

153. In other settings, the long-term or perpetual arrangements that Google has imposed on developers might have been difficult to enforce. That is not the case here. By requiring developers to use Google Play Billing in support of the purchase for all In-App Content, Google can readily monitor and enforce its take rates, enabling extraction of a supra-competitive commission for as long as the App is used and In-App Content is purchased.

154. Only about three percent of the developers that sold In-App Content in the In-App Aftermarket through Apps initially downloaded from the Play Store in 2020 were able to circumvent the restriction, although Google later announced that it was going to enforce the restriction on this group.[343] Those few developers able to circumvent Google's restrictions have garnered a critical mass of consumers and widespread name recognition, which has enabled them to allow users to purchase their In-App Content from other platforms. The most prominent developers in this category are Netflix, Amazon, Spotify, Match Group, and Epic.[344] A company like Netflix, a household name with over 200 million subscribers, does not want to hand over to Google 30 percent of first-year subscriber revenue simply because a consumer created her account on her Android App. Circumventors like Netflix were able to steer users to their websites, where consumers could create a new account not subject to Google Play Billing.[345] Developers engaging in this steering had to do so indirectly—through communications outside the App—because Google's agreements with developers preclude them from explicitly steering users to the

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341. Revenue share, *available at* docs.catappult.io/docs/distribution-and-revenue-share ("Self-distribution opens the possibility for the developer to promote and distribute their apps through their own channels and earn a revenue share of 90%").

342. GOOG-PLAY-000005203 at GOOG-PLAY-000005221; GOOG-PLAY-000005264. *See also* Kim Byung-wook, *Google's app billing plan continues to backfire*, THE KOREA HERALD (June 28, 2021), *available at* www.koreaherald.com/view.php?ud=20210628000824 ("Unlike Google, ONE store allows app developers to operate their own billing systems. In this case, the cut is 5 percent.").

343. Google - Android Developers Blog, *Listening to Developer Feedback to Improve Google Play (*Sept. 28, 2020), *available at* android-developers.googleblog.com/2020/09/listening-to-developer-feedback-to.html

344. EPIC_GOOGLE_00123016; EPIC_GOOGLE_01389946. Google still holds significant power over these companies. For instance, Match Group's chief legal officer, Jared Sine, in testimony before the United States Senate detailed communications from Google inquiring into why his testimony might differ from what they had already discussed. "When you receive something like that, Senator, from a company that can turn you off overnight, you're always a little intimidated," said Sine. He added, "We're all afraid, is the reality, Senator." Angel Au-Yeung, *App Providers Are 'All Afraid' Of Apple's And Google's Market Power, Match Group And Spotify Tell Senate*, FORBES (Apr. 21, 2021), *available at* www.forbes.com/sites/angelauyeung/2021/04/21/app-providers-are-all-afraid-of-apples-and-googles-market-power-match-group-and-spotify-tell-senate/?sh=4a622ae9596c. *See also* GOOG-PLAY-000559379 at GOOG-PLAY-000559382 ([redacted]).

345. [redacted]

developer's website for digital content purchases.[346] The vast majority of developers do not possess the requisite widespread user adoption, name recognition, and clout to circumvent Google's restriction.

2. Google's Revenue-Sharing Agreements with Developers Have Substantially Eliminated the Threat of Defection to Alternatives in the In-App Aftermarket

155. Google has taken steps to rein in any developers whom it perceived might threaten to use alternative authorization and billing systems in the In-App Aftermarket to avoid Google's take rate.

156. Google chose these developers because [348] Indeed, Google estimated that defection by these developers could cost Google [349] Google

157. Depositions to date have [351]

158.

346. When Epic explicitly steered consumers to their own payment system rather than Google's system by providing a 20% discount, Google removed Epic's Fortnite from the Play Store. *See* Jack Nicas, *How Apple's 30% App Store Cut Became a Boon and a Headache*, NEW YORK TIMES (Aug. 14, 2020), *available at* www.nytimes.com/2020/08/14/technology/apple-app-store-epic-games-fortnite.html. Google states that developers are allowed to use other platforms in addition to Google Play, but that they cannot directly advertise alternative options through their App. *See* Google - Play Console Help, *Understanding Google Play's Payments policy*, *available at* support.google.com/googleplay/android-developer/answer/10281818?hl=en#zippy=%2Ccan-i-distribute-my-app-via-other-android-app-stores-or-through-my-website%2Ccan-i-communicate-with-my-users-about-alternative-ways-to-pay%2Ccan-i-communicate-with-my-users-about-promotions-on-other-platforms.

347. *See* GOOG-PLAY-000559379 at GOOG-PLAY-000559382 ( ). *See also* Koh Dep. at 153:10-19 ( ) (testifying about PX. 136 – GOOG-PLAY-003332817.R at GOOG-PLAY-003332822.R).

348. GOOG-PLAY-000233314

349. GOOG-PLAY-000000807

350. *See* GOOG-PLAY-000004762.R at GOOG-PLAY-000004764.R.

351. Koh Dep. at 368:4-369:4.

("ADAP"), which focused on music Apps; and (3) the [redacted]

E. Google Cannot Claim That Its Supracompetitive Profits Are Constrained by the "Single Monopoly Profit" Theory

159. In the 1970s and 1980s, economists belonging to the "Chicago School" of economics—which promotes the virtues of free-market principles[354]—condoned many exclusionary strategies with an economic theory that has become known as the "single monopoly profit" ("SMP") theory. The SMP theory posits that, since a monopolist will always find a way to fully exploit its monopoly profit in the market it has monopolized, regardless of the existence of a secondary market or aftermarket, any exclusionary conduct in the secondary market is motivated by procompetitive reasons, such as vertical integration efficiencies, and should not be condemned as anticompetitive.[355]

160. Applied to this case, Google may erroneously argue that the SMP theory could be interpreted to deem Google's Aftermarket Restrictions procompetitive and lacking in harm to competition or consumers. It would posit that if Google were prohibited from engaging in the Challenged Conduct, Google would merely raise its take rate in the Android App Distribution Market or impose some other fees to fully restore the profits it now extracts from the In-App Aftermarket. SMP theory suggests that, so long as Google had a monopoly in the Android App Distribution Market, it would find a way to fully extract a monopoly profit from that market, such that there would be no incentive to further monopolize the In-App Aftermarket. In this section, I explain how two of the key assumptions that undergird the SMP theory are not satisfied, meaning that the profits Google has extracted from the In-App Aftermarket were not available to Google solely on the basis of its monopoly in the Android App Distribution Market. Accordingly, Google's anticompetitive conduct in the In-App Aftermarket was motivated to extract incremental supra-competitive monopoly profit from developers.

161. A wave of new economic research in the 1990s and 2000s has shown that the implications of the SMP theory hold only if certain assumptions that underlie it also are true.[356] As it is applied to artificially linking a monopolized service—here, Android App distribution—with a product or service in another market—here, services in support of the purchase of In-App Content—the five conditions under which the SMP theory holds are:

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352. GOOG-PLAY-004144047.R at GOOG-PLAY-004144052.R (explaining this program would only be available to those developers who represented [redacted]).

353. GOOG-PLAY-003881390.R.

354. Akhilesh Ganti, *Chicago School of Economics*, INVESTOPEDIA (Feb. 21, 2021), *available at* www.investopedia.com/terms/c/chicago_school.asp.

355. *See, e.g.*, Robert Bork, THE ANTITRUST PARADOX: A POLICY AT WAR WITH ITSELF (Bork Publishing 2021); Aaron Director & Edward H. Levi, *Law and the Future Trade Regulation,* 51 NW. U. L. REV. 281 (1956).

356. For a review of the economic literature, see Einer Elhauge, *Tying, Bundled Discounts and the Death of Single Monopoly Profit Theory*, 123(2) HARVARD LAW REV. 397-481 (2009).

(1) buyers do not use varying amounts of the linked product or service (in the In-App Aftermarket);

(2) buyers exhibit a strong positive correlation in their demands for the linked product or service (in the In-App Aftermarket) and the linking products or services (in the Android App Distribution Market);

(3) buyers do not use varying amounts of the linking product or service (Android App distribution);

(4) the competitiveness of the linked market (the In-App Aftermarket) is fixed; and

(5) the competitiveness of the linking market (the Android App Distribution Market) is fixed.[357]

162. When any one of these assumptions is not supported empirically, then the pro-competitive justifications of SMP theory do not hold.[358] Here, assumptions (1) and (4) are not satisfied. Failure to satisfy either one would undermine application of SMP theory. Failure to satisfy both assumptions strengthens that conclusion. Because SMP theory does not apply here, Google is using its Aftermarket Restrictions to extract profits it otherwise would not be able to obtain. The inapplicability of SMP theory implies an anticompetitive motivation for Google's Aftermarket Restrictions.

163. Recall that Google's take rate in the In-App Aftermarket is tethered to the spending on In-App Content by the consumer. Although the buyer in the In-App Market is the developer, the demand for the services in support of consummating the purchase of In-App Content is derived from the demand for the In-App Content itself. Applied to this case, for Google to extract consumer surplus solely by virtue of its market power in the Android App Distribution Market, assumption (1) requires that consumers do not purchase varying amounts of In-App Content. This is plainly false. Different consumers purchase different quantities of In-App Content, and therefore Google's revenues through its take rates anticompetitively applied to those purchases vary by consumer. This is evident from my examination of Google's transaction database. Figures 4, 5, and 6 show the distributions of purchases of In-App Content for three of the top-selling games.

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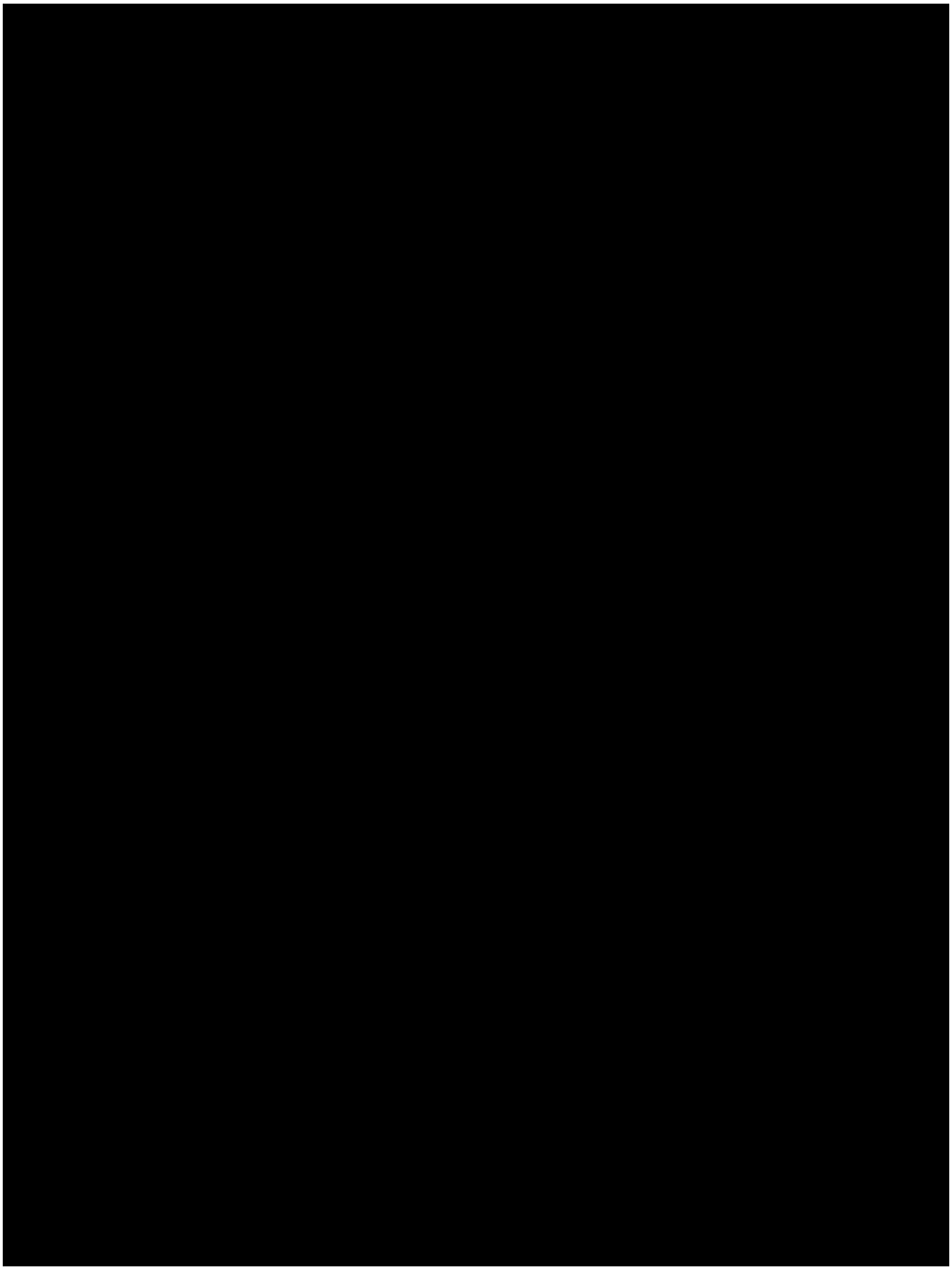
357. *Id*. at 404 ("However, the model indicating a single monopoly profit *depended on several key assumptions*: (1) fixed usage of the tied product; (2) strong positive demand correlation; (3) fixed usage of the tying product; (4) fixed tied market competitiveness; and (5) fixed tying market competitiveness. As the economic literature shows, different results are reached if one relaxes these narrow assumptions. Indeed, relaxation of any one of these assumptions produces a distinctive profit increasing effect.") (emphasis added).

358. *Id*. For example, when assumption (1) is violated and consumers use varying amounts of the linked product or service, tying can be used to extract consumer surplus, with buyers who use more of the tied product effectively paying more for the same product. Discriminating with ties may be more effective than traditional price discrimination—that is, charging a different price to each buyer—if the firm could not otherwise tell how much buyers value the tying product.



164. As the figures demonstrate, the consumers' purchases of In-App Content vary widely across buyers, proving that assumption (1) is violated. The varying amounts of purchases of In-App Content provides an anticompetitive motivation for Google's extension of its monopoly power in the Android App Distribution Market into the In-App Aftermarket to extract more revenue from its monopoly position—an opportunity that would not exist in the absence of the Aftermarket Restrictions. Google may argue that it inserted itself into the In-App Aftermarket via the restraint requiring developers to use Google Play Billing for all transactions so as to monitor and "meter" both a customer's usage and a developer's in-app sales for an App. However, as a matter of economics, Google cannot extract the same level of monopoly profits through this restriction as it would solely through a monopoly in the Android App Distribution Market. Given the wide range of purchases of In-App Content, it would be very difficult for Google to predict, *ex ante*, a given consumer's propensity to make particular in-app purchases. Such a prediction would be needed by Google to replicate a metering strategy with upfront pricing for Apps sold solely in the Android App Distribution Market through the Play Store.[359] The problem for Google is that it is impossible to know *ex ante* how much any given consumer/developer combination will use an

359. A "metering tie" occurs whenever a firm meters usage of its product by requiring users to purchase at elevated prices a tied product that is needed to use its product, as in the case of printers and ink. Economists have shown that, contrary to the Chicago School, metering ties are often used for anticompetitive purposes. *See, e.g.*, Einer Elhauge & Barry Nalebuff, *The Welfare Effects of Metering Ties*, 33 JOURNAL OF LAW, ECONOMICS & ORGANIZATION 68 (2017) (showing that metering ties (1) *always* lower consumer welfare and total welfare unless they increase capital good output, and (2) *always* harm consumer welfare, even when output increases, under realistic market conditions in which usage rates are independently distributed from per-usage valuations). Applied here, there is no credible theory under which Google's restrictions increased output in the Android App Distribution Market. Indeed, to the extent a foreclosed rival in the In-App Aftermarket could have evolved into a competitive app store, Google's restrictions could have reduced output in the Android App Distribution Market as well. *See, e.g.*, GOOG-PLAY-004564758 ( ).

App and subsequently generate any in-app purchases so as to be able to price Apps to generate a supra-competitive monopoly profit for Google.

165. In addition to assumption (1) being violated, assumption (4) requires that the "competitiveness" of the In-App Aftermarket be "fixed"—that is, the tied market is perfectly competitive in a way that tying cannot alter. Applied here, that would mean that In-App Aftermarket rivals (such as independent payment processors or developers) face no entry or fixed costs and can expand instantaneously to supply the whole market.[360] If true, then the extent of competition in the In-App Aftermarket would be invariant to Google's tie-in, in the sense that Google's inserting its payment processing service into the In-App Aftermarket cannot be used to reduce the competitiveness or efficiency of rivals or potential rivals in the In-App Aftermarket.[361] This assumption is not true, however, because Google's contractual linkage is specifically designed to prohibit developers from using any alternative to Google Play Billing to provide In-App Aftermarket services. In the absence of the requirement, there would be myriad third-party providers of payment processing and other In-App functions for developers (such as authorizing the use of In-App Content, record keeping, and server hosting), which would engender competition on take rates.

166. Moreover, the infrastructure to provide payment processing (and authorization) exhibits economies of scale;[362] the same payment system (or record-keeping system or server) can be used for each additional transaction, with little additional marginal cost. Accordingly, depriving third-party competitors in the In-App Aftermarket of scale economies makes them weaker competitors and alters the state of competitiveness in the In-App Aftermarket. Google's tie-in can foreclose enough of the tied market to make entry revenues, spread across a lower base of transactions, lower than entry costs. Just as a monopoly resort that requires guests to eat all meals on the property (a tie-in) can foreclose independent local restaurants and prevent them from achieving the requisite economies of scale,[363] so too has Google foreclosed rival suppliers in the In-App Aftermarket, resulting in the ability for Google to charge supra-competitive take rates on purchases of In-App Content. In an open, competitive In-App Aftermarket, consumers would be free to choose an alternative payment processor, and take rates in the In-App Aftermarket would fall towards competitive levels. In the next section, I offer two models that can be used to estimate

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360. Einer Elhauge, *Tying, Bundled Discounts, and the Death of the Single Monopoly Profit Theory*, 123(2) HARVARD LAW REVIEW 397-481, 413 (2009).

361. *Id.* ("the economic literature summarized below shows that a tie that forecloses enough of the tied market can reduce rival competitiveness by impairing rival efficiency, entry, existence, aggressiveness, or expandability.").

362. *See, e.g.*, Oxera, *Paying up: the new economics of payment systems* (Jun. 30, 2020), *available at* www.oxera.com/insights/agenda/articles/paying-up-the-new-economics-of-payment-systems/ ("Retail payments have long been characterised by the following three economic features …. economies of scale—which mean that it can be more efficient to operate a platform with a large number of users (although regulatory and technical developments are tending to reduce the importance of this)."); Risto Gogoski, *Payment systems in economy - present end future tendencies*, 44 PROCEDIA - SOCIAL AND BEHAVIORAL SCIENCES 436–445, 438 (2012) ("The payment industry also exhibits considerable economies of scale. First, the value that an individual participant derives from using a particular payment system increases with the number of other parties using that same system. Second, high levels of initial investment (called 'sunk costs') are required in order to establish a payment system, and considerable fixed costs are incurred in the operation of such a system (more payments less costs).").

363. This example comes from Dennis Carlton, *A General Analysis of Exclusionary Conduct and Refusal to Deal—Why* Aspen *and* Kodak *Are Misguided*, 68(3) ANTITRUST LAW JOURNAL 659-983 (2001).

those reduced take rates in the Android App Distribution Market and in the In-App Aftermarket, respectively.

V. THE CHALLENGED CONDUCT CAN BE SHOWN TO HAVE GENERATED ANTITRUST IMPACT USING COMMON METHODS AND EVIDENCE

167. A key difference in the two relevant antitrust markets—the Android App Distribution Market being two-sided and the In-App Aftermarket being one-sided—allows for different methods for assessing impact or what take rates and consumer subsidies would prevail in each market without Google's Challenged Conduct. I discuss these two methods and their implications in turn. In both cases, the modeling inputs are common to the class. In Part V.B, using a two-sided model developed by Rochet and Tirole, where the locus of competition is on the developer take rate, I show classwide impact for those Class members in the Android App Distribution Market. In Part V.C., using a one-sided model of price competition, I show classwide impact for Class members in the In-App Aftermarket. In Part V.E, again using the two-sided model developed by Rochet and Tirole, where the locus of competition is instead on the consumer subsidy, I show classwide impact for those Class members. In Part VI, I estimate aggregated damages to the Class based on these impact models.

168. My analysis differs from the standard regression analysis commonly used in many price-fixing matters to isolate the effects of anticompetitive conduct in a limited timeframe compared to a competitive market absent the challenged restraints. Because Google has imposed the Challenged Conduct in both the Android App Distribution Market and the In-App Aftermarket since those markets were originally formed, there is no pre-existing or post-conduct time period to use for purposes of standard regression analysis. Accordingly, I employ widely accepted economic models to determine take rates that would be charged in a hypothetical but-for world without the Challenged Conduct. Before introducing the models, I briefly explain how multi-homing (by customers and developers) and steering (by developers) would put downward pressure on take rates in the absence of the Challenged Conduct.

A. Multi-Homing and Steering Would Put Downward Pressure on the Take Rate That Google Imposes on App Developers

169. As I will show here using evidence and methods common to the Class, Google's Challenged Conduct has enabled Google to charge developers supra-competitive take rates in the Android App Distribution Market and the In-App Aftermarket. With its dominance in the Android App Distribution Market and consequent market power in the In-App Aftermarket, Google is able to extract a supra-competitive take rate on all paid App downloads and purchases of In-App Content. This is true even after Google's reduction in its take rates announced in March 2021 (from 30 percent to 15 percent on the first $1 million of developer revenue)[364] and for subscription

364. Sameer Samat (Google Vice President, Product Management), *Boosting Developer Success on Google Play* (Mar. 16, 2021), *available at* android-developers.googleblog.com/2021/03/boosting-dev-success.html ("Starting on July 1, 2021 we are reducing the service fee Google Play receives when a developer sells digital goods or services to 15% for the first $1M (USD) of revenue every developer earns each year.") Although the new policy applies to all developers, the overall reduction in the take rate is less significant for larger developers, because it applies only to the first $1 million in revenue. For example, developer with $10 million in revenue would pay a 15 percent take rate on the first $1 million, and a 30 percent take rate on the remaining $9 million, which works out to an overall take rate of 28.5 percent.

payments after the first year as of January 1, 2018 (reduced to 15 percent).[365] The concepts of multi-homing and steering are critical to understanding how Google's contractual restraints with OEMs, developers, and mobile carriers work as an economic matter.

1. Multi-Homing

170. Multi-homing, as the name suggests, occurs whenever buyers or sellers on the opposite sides of a two-sided platform use more than one platform for the same or similar purpose. For example, many young Internet users have social media accounts on two or more social media platforms (e.g., Facebook and TikTok). Many ride-sharing drivers and riders have both Uber and Lyft on their phone, another form of multi-homing. Multi-homing is not exclusive to the digital world: People carry two or more credit cards in their wallets, and the stores they frequent accept more than one card, although anti-steering rules imposed by one of the most popular credit cards may inhibit card competition.[366]

171. In the context of this case, multi-homing exists to the extent consumers have app stores side-by-side on their mobile phone's home screens (if Google's conduct did not prevent consumers from having multiple app stores)—the adjacent placement is necessary so that multi-homing is equally convenient for consumers. When two platforms are sufficiently close substitutes in the eyes of buyers and sellers, multi-homing can lead to competitive outcomes that benefit both buyers and sellers.[367]

172. Multi-homing would occur absent the Challenged Conduct, as developers would be willing to distribute their applications through alternative app stores if they could achieve sufficient reach by doing so. And users would be willing to install the second app store on their home screens if (1) they could access their favorite Apps on a rival app store, and (2) if at least some of those Apps were available at a lower price on the second app store—a phenomenon that, in a competitive world absent Google's restrictions, would be made possible via steering.[368]

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365. Although Google decreased the take rate for subscription services from 30 percent to 15 percent in 2018, the decrease was only applicable after the first year. (It wasn't until January 1, 2022, that the take rate was reduced to 15 percent for all subscription services across the board). Google documents indicate that [redacted] on in-app purchases occurs within [redacted] which would have limited the effect of the 2018 policy. *See* GOOG-PLAY-007819776 at GOOG-PLAY-007819909. Moreover, Google estimates in the lead-up to the announcement found [redacted] because [redacted] *See* GOOG-PLAY-000446626 at GOOG-PLAY-000446629. Another Google analysis calculated the effective take rate resulting from the [redacted] *See* GOOG-PLAY-001291233 at GOOG-PLAY-001291251. In contrast, the competitive but-for world is one in which all developers would have enjoyed substantial and permanent reductions in the take rate and would be characterized by long-run equilibrium price adjustments to substantially developer lower costs flowing from substantially lower take rates. As a consequence, I conclude that Google's reduction in the take rate for subscriptions is unlikely to provide an adequate natural experiment that could be used to accurately measure the extent to which consumers would have paid lower prices in the but-for world.

366. Of course even if there is multi-homing, restrictions can create less than a competitive outcome. *See, e.g.,* Kevin Caves & Hal Singer, *Competing Approaches to Antitrust: An Application in the Payment Card Industry*, 27(3) GEORGE MASON LAW REVIEW 823-861 (2020).

367. Susan Athey & Fiona Scott Morton, *Platform Annexation*, Stanford Inst. for Econ. Policy Research Working Paper 21-015 (March 2021).

368. Although my primary impact model focuses on price effects (over the take rate), it is possible that competition would occur on non-price quality dimensions as well. For example, a specialized app store could emerge that provided better discoverability features, forcing Google to compete on that dimension.

2. Steering

173. Steering can exist in any type of market, but in the context of the two-sided platform present in this case, steering would entail a developer charging differential prices to consumers based on which platform the consumer selects, from which to download an App. The developer's aim, if steering were allowed, would be to induce consumers to transact over a lower-cost platform.[369] Economists have shown that, in a platform setting, steering puts downward pressure on the prices charged by sellers (here, developers), and thus anti-steering restraints are almost certainly harmful to competition.[370] [redacted][371]

174. Steering occurs regularly across platforms in other industries where there are no restrictions that prevent it. One example is the market for "daily deals"—or discounted prices on certain products or services on a specific day—offered by platform apps like Groupon and Living Social. Empirical research has shown that in markets where there is platform competition, sellers on the sites offer more valuable promotions to buyers at lower prices relative to markets without platform competition.[372]

175. With multi-homing and steering—both conditions are necessary for competition to drive down prices to consumers—developers could, and would be incentivized to, charge a lower price for Apps to consumers who download Apps from a lower-cost app store platform. Consider a scenario in which a developer faced two take rates: Google's 30 percent rate and a rival app store's 15 percent rate. For simplicity, assume the developer charges $1 for downloading the App. In a world with multi-homing, the developer would have strong incentives to steer its customers to the lower-cost platform, as doing so would save it $0.15 per download (equal to the product of the 15 percent differential in take rates and $1). Indeed, the developer would be willing to offer up to a $0.15 reduction in the price of the App to steer its customers to the lower-cost platform. As more customers shift their downloads to the rival platform, Google would be forced to revisit its take rate; a lower Google take rate would in turn induce developers to lower their prices on the Play Store. I model this competitive dynamic formally in the following sections.

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369. *See, e.g.,* Rochet & Tirole at n. 3 ("The occurrence of steering is easiest to visualize in those illustrations in which platforms charge per-end-user-transaction fees: The seller of a house or a B2B supplier may only list the house or the wares on the cheapest platform.").

370. *See, e.g.,* Benjamin Edelman & Julian Wright, *Price Coherence and Excessive Intermediation,* 130 Q. J. ECON. 1283 (2015); Rong Ding, *Merchant Internalization Revisited,* 125 ECON. LETTERS 347 (2014); Rong Ding & Julian Wright, *Payment Card Interchange Fees and Price Discrimination*, 65 J. IND. ORG. 39 (2017). For an overview of the intersection of multi-homing and steering, see Erik Hovenkamp, *Platform Antitrust*, 44 JOURNAL OF CORP. LAW 713 (2019) ("A second type of steering is undertaken by sellers on one side of a transaction platform. In most situations where buyers and sellers both multi-home, the buyer ultimately chooses the platform used to mediate his transactions. … Alternatively, the seller may vary the prices it charges in transactions over different platforms, applying a surcharge to those it disfavors (or, equivalently, a discount for transactions on its preferred platform). Such steering efforts were forestalled by the restraint at issue in *AmEx*, which is discussed further below.").

371. GOOG-PLAY-006829073.R at GOOG-PLAY-006829085.R.

372. Kim et al., *Two-sided platform competition with multihoming agents: An empirical study on the daily deals market*, 41 INFORMATION ECON. AND POLICY 36-53 (2017).

B. A Two-Sided Platform Model with Multi-Homing Shows That Google Would Be Compelled to Lower Its Take Rate from Developers in the Absence of Google's Android App Distribution Market Restraints

176. I start by analyzing the impact of the Challenged Conduct in the Android App Distribution Market. For this purpose, I use a model based on the one developed by economists Jean-Charles Rochet and Jean Tirole (winner of the Nobel prize in economics for, among other things, his pioneering work on monopolized industries) who formalized the economic framework for two-sided markets.[373] This framework has been widely cited by other economists.[374]

177. The model shows by how much Google's take rate on paid initial App downloads in the Android App Distribution Market would fall if the locus of competition occurs on the developer side of the platform once Google's multiple restraints and technical barriers are removed. The model shows what Google would charge developers in the presence of multi-homing and steering, which would occur in the absence of Google's exclusionary restraints. Although Google's exclusionary conduct was aimed at myriad potential entrants—including mobile carriers, OEMs, and developers—my analysis of a potential but-for world requires entry by only one rival app store platform with a comparable number and quality of Apps as are available in the Play Store. Although Google has consistently charged a take rate at (or very close to) 30 percent for the vast majority of consumer expenditures,[375] my analysis also takes account of Google's current take rates. For example, the take rate has been lowered from 30 to 15 percent for (1) subscription App renewals beginning January 1, 2018, and (2) transactions made for Apps and In-App purchases for a developer's first $1 million in annual sales beginning July 1, 2021.[376] I discuss the basic intuition behind this model and show how it can be readily adapted to the current setting.

178. In the event that the factfinder concludes that the Android App Distribution Market and In-App Aftermarket are not two separate markets, I have performed two alternative analyses, both of which apply the two-sided market framework to a single, combined market. These analyses (presented Part V.E and Appendix 4) contemplate competitive scenarios in which platforms compete for all transactions (both initial downloads and in-App purchases) in the aggregate. In

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373. Rochet & Tirole.

374. *See, e.g.*, Marc Rysman, *The Economics of Two-Sided Markets*, 23(3) JOURNAL OF ECONOMIC PERSPECTIVES 125-43 (2009); Avi Goldfarb and Catherine Tucker, *Digital Economics*, 57 JOURNAL OF ECONOMIC LITERATURE 3-43 (2019); Joseph Farrell & Paul Klemperer, *Coordination and lock-in: Competition with switching costs and network effects,* in MARK ARMSTRONG AND ROBERT PORTER EDS., 3 HANDBOOK OF INDUSTRIAL ORGANIZATION (Elsevier 2007).

375. *See, e.g.*, Table 5, *infra*, Row 3 (showing that Google collected service fees in excess of 29 percent of consumer expenditures from 8/16/2016 – 12/31/2020).

376. The relatively few developers who paid reduced take rates in the actual world would also have paid take rates below the but-for level. Google's anticompetitive conduct resulted in a substantially inflated headline take rate of 30 percent, which is economically equivalent to inflating the list price of a product in an antitrust context. Customers that receive discounts from an inflated list price still incur antitrust injury because the discounts they receive are tied to the list price. *See, e.g.,* Hal Singer and Robert Kulick, *Class Certification In Antitrust Cases: An Economic Framework,* GEORGE MASON LAW REVIEW (2010), 1046-47, 1049 (explaining that class members are impacted even when they receive discounts relative to an inflated list price; here the list price is Google's headline take rate of 30 percent). Thus, even developers who paid reduced take rates in the actual world would have also paid lower take rates in the but-for world, and would have passed on some of the resulting savings to consumers. In Part VII, I demonstrate how damages can be calculated for individual Class Members using common methods, taking into account the fact that a limited number of developers received discounts relative to Google's standard 30 percent take rate.

Appendix 4, the locus of competition occurs on the developer side of the platform. In Part V.E, it occurs on the consumer side.[377]

1. The Platform Model in a Monopolized Setting

179. The two sides of the Android App Distribution Market are consumers of initial App downloads (buyers) and App developers (sellers). Google sets the commission it has charged developers for using the Play Store. Google does not charge consumers for accessing the Play Store and instead offers a small subsidy in the form of its loyalty points program, Google Play Points, effectively implying a small *negative* price (or subsidy) for consumers using the Play Store.[378] Importantly, while Google sets the commission charged to developers, developers set their own prices on App downloads.[379] As my extension of the Rochet-Tirole model illustrates, developers that can offer their Apps on an app store that charges a lower commission than Google will be incentivized to "steer" consumers to the alternative app store by charging lower prices on downloads in that alternative app store than they charge in the Play Store. In this way, consumers would also benefit from competition between app stores.

180. I begin by outlining the classic two-sided market model in which a platform operator sets per-transaction platform prices on both sides of the market where the platform operator has a monopoly (the "foundational monopoly model"). I then demonstrate how this model is easily extended to the instant case, where Google sets a take rate or commission imposed directly on developers instead of a per-transaction price and provides a subsidy to consumers in the form of loyalty points (the "applied monopoly model"). A portion of the supracompetitive cost imposed on developers through the take rate is passed through to consumers (which I show in Section V.D below). I then describe the foundational and applied models in a setting where there is platform competition.

a. The Foundational Monopoly Platform Model

181. The Rochet-Tirole model was developed in a situation in which the operator of the two-sided platform has a monopoly and sets per-unit prices on both sides of the market to sellers and buyers.

182. In the instant case, Google controls the substantial majority of all App downloads on Android-compatible mobile devices and can thus appropriately be thought of as a platform monopolist. As a platform operator, Google has the ability to charge both buyers and sellers for using the Play Store.

183. Google's charge to consumers (buyers) can be thought of as Google's ability to charge for transactions, which I denote as P_B. As is typical for many two-sided markets, Google sets the consumer access price (in this case, a subsidy) near zero.[380] As for developers (sellers),

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377. The model presented in Part V.E can also be applied if there are two relevant markets.

378. The subsidy referenced here is paid by Google to the consumer. The consumer still pays a positive price to the developer—albeit a lower one due to the subsidy.

379. Google limits prices to between $0.05 and $400.00 on the Google Play Store. Google - Play Console Help, *Supported locations for distributions to Google Play users, available at* support.google.com/googleplay/android-developer/answer/10532353?visit_id=637777015722462270-3131223409&rd=1.

380. *See, e.g.,* John M. Newman, *Antitrust in Zero-Priced Markets: Foundations*, 164 PENN LAW REVIEW 149-206 (2015). The consumer also pays for access by sharing her data with the platform operator.

Google charges a take rate, or percentage of sales, of up to 30 percent. The foundational model uses a per-unit transaction price on the seller side, which I denote as P_S, instead of a percentage take rate. In the foundational model, P_B and P_S should be understood as prices charged to consumers (buyers) and developers (sellers), respectively, for a transaction made on the platform. These prices are distinct from the price of the actual product being purchased (App downloads). Maximizing profit (by taking the derivative of the profit equation with respect to both prices) leads to an optimal pricing rule under a two-sided monopoly platform:

(V.1) $$\frac{P_B + P_s - C}{P_B + P_s} = \frac{1}{\varepsilon_B + \varepsilon_S}$$

where $\varepsilon_B, \varepsilon_S$ are the price elasticities of demand for the buyer and seller, respectively.[381] The left-hand side of this expression represents the platform operator's per-unit margin. In maximizing its profit, the monopolist will choose to set platform prices to buyers and sellers according to their price elasticities of demand, and C represents the platform operator's incremental cost of executing a transaction. As observed in Rochet and Tirole 2003, when expressing the total price charged by the platform ($P = P_B + P_S$) and the combined elasticity with respect to both sides of the market faced by the platform ($\varepsilon = \varepsilon_B + \varepsilon_S$), Equation (V.1) simplifies to what is known as the Lerner index, the standard inverse elasticity formula:

(V.2) $$\frac{P - C}{P} = \frac{1}{\varepsilon}$$

This expression is widely recognized in economic theory and suggests that firms with pricing power increase prices until the markup of price over marginal cost is equal to the inverse of the firm's own-price elasticity.[382]

b. Application of the Two-Sided Monopoly Platform Model to the Play Store

184. I now adapt the Rochet-Tirole model set out above to fit the current circumstances. I accommodate three key features that distinguish the adapted model from the foundational monopoly model described above. *First*, Google charges a take rate to developers on the Play Store as a percentage of developers' revenues rather than a per-unit price. *Second*, as I demonstrate later in Part V.D using standard economic principles, the take rate imposed on developers is passed through at least in part to consumers. This pass-through results in product prices that will be affected by the take rate. *Third*, through its Play Points loyalty program and other promotions, Google offers a subsidy (a negative platform price) on the consumer side.

185. Define the take rate t as the commission charged by Google to developers for using the platform (typically 30 percent with the exceptions discussed above). The per-unit amount paid to Google by the developer is equal to the take rate multiplied by the product price, which I will denote as S. For example, if an App is priced at $S = \$10$ and the take rate is 30 percent, the developer will pay 0.3*$10 = $3 to Google. Indeed, this arrangement is analogous to setting

381. Rochet & Tirole at 996-997. In mathematical terms, the elasticity of demand is defined as the percentage increase in demand divided by the percentage decrease in prices.

382. *See, e.g.,* Landes & Posner at 937 (1981).

platform prices $P_S = tS$. It is important to note that the *product* price S is also affected by the take rate, because the take rate represents a cost to developers, a significant portion of which is typically passed on to consumers in the form of higher product prices. I estimate the rate of pass-through in Section V.D and denote it here with the symbol γ. The pass-through rate is equal to the portion of an increase in costs incurred by developers (including those from increased commissions), which is passed through to consumers in the form of higher product prices. For example, if costs to a developer increase by one dollar, a pass-through rate of 0.90 means that product prices for consumers increase by $0.90. Allowing for this relationship, Equation (V.1) becomes:

(V.3) $$\frac{P_B + tS - C}{tS + t^2 S'} = \frac{1}{\varepsilon_{B,t} + \varepsilon_{S,t}}$$

where $\varepsilon_{B,t}$ and $\varepsilon_{S,t}$ are price elasticities of demand for transactions from buyers (consumers) and sellers (developers), respectively, now taken with respect to the take rate t, which takes the place of the platform price, and $t^2 S'$ is an additional term which accounts for the effects of the take rate on the product price.[383] Appendix 3 contains a derivation of Equation (V.3).

2. The Platform Model in a Competitive Setting

a. The Foundational Competitive Model

186. When competition to the platform monopolist is introduced, both buyers and sellers can connect to more than one platform, which, as discussed above, is known as multi-homing.[384] With multi-homing, the monopolist loses some pricing power, resulting in a lower equilibrium take rate. The competitive pressure on the take rate occurs through two channels: (1) the platform's incentive to attract sellers, and (2) sellers' ability to steer buyers by way of lower product (in this case App) prices.[385]

187. All else equal, sellers will prefer to use the platform that charges a lower seller-side platform price (P_S), assuming that the alternative platform has a roughly comparable menu of products and therefore attracts a significant base of consumers. A competing platform under this assumption can therefore attract sellers away from a rival by offering a lower platform price. This first effect on platform prices, namely downward pressure in the face of competition, is analogous to the familiar forms of price competition that occur in countless industries.

188. A second effect stems from sellers' incentive to avoid a higher take rate, all things equal, while having access to the most buyers possible. Because sellers here set their own product

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383. S' represents the amount by which the product price S changes when there is a change in the take rate. Appendix 3 contains further details regarding this term.

384. Rochet & Tirole at 991-992 ("In a number of markets, a fraction of end users on one or the two sides connect to several platforms. Using the Internet terminology, we will say that they 'multihome.' For example, many merchants accept both American Express and Visa; furthermore, some consumers have both Amex and Visa cards in their pockets. Many consumers have the Internet Explorer and the Netscape browsers installed on their PC, and a number of Web sites are configured optimally for both browsers.").

385. *Id.* at 1001 ("This increases demand for Platform 1 in two ways: The platform attracts new merchants…and 'steers' former multihoming merchants.").

prices, they can "steer" buyers to a platform by offering lower product prices on that platform. Steering is facilitated when a rival platform charges a lower platform price, because a seller using the platform with a lower platform price has a price differential available to lower prices and steer customers.

189. In a competitive platform setting, the platform's optimal pricing rule from Equation (V.1) becomes:[386]

(V.4) $$\frac{P_B + P_S - C}{P_B + P_S} = \frac{1}{\varepsilon_{OB} + \varepsilon_{OS}}$$

This formula now reflects the buyers' "own-brand" elasticity, ε_{OB}, and the sellers' "own-brand" elasticity, ε_{OS}. Own-brand elasticity is the change in demand for a given platform due to an increase in the price of transacting on that particular platform. This elasticity varies from the elasticity in the monopoly setting due to the presence of competition from rival platforms. In a monopoly setting, a consumer may choose not to transact in the face of a price increase but will not have the option of transacting on an alternative platform. In a competitive setting, a consumer may choose not to transact at all or may choose to transact on a competing platform. The presence of a competitive option suggests a greater elasticity of demand relative to that of the monopoly setting.

190. The own-brand elasticities cause the denominator on the right-hand side of Equation (V.4) to increase relative to the denominator in Equation (V.1). This higher denominator leads to a lower margin on the left-hand side, which implies lower equilibrium platform prices ($P_B + P_S$) in the presence of competition.

b. Application Of The Two-Sided Competitive Platform Model to The Instant Case

191. Applying the competitive model to this case results in an expression analogous to Equation (V.4):

(V.5) $$\frac{P_B + tS - C}{tS + t^2S'} = \frac{1}{\varepsilon_{OB,t} + \varepsilon_{OS,t}}$$

As in Equation (V.3), the platform prices P_s on the left side of the expression has been replaced with its take rate analogue (tS), and there is an additional term in the denominator which accounts for the effect of a new take rate on product prices. The platform price elasticities on the right-hand side have also been replaced with their take rate analogues, now reflecting the introduction of competition ($\varepsilon_{OB,t}$ is own-brand elasticity of demand taken with respect to the take rate on the

386. *Id.* at 1004. I derive this expression by replacing market demand faced by the platform operator (in the monopoly setting) with residual demand, where residual demand is defined as market demand minus demand that is met by the platform's rivals. Rochet and Tirole model competition in the form of a duopoly and express the seller side own-brand elasticity as $\varepsilon_{OS} = \varepsilon_S/\sigma$, where σ is a single-homing index. I use the more general notation to show that in my extension of the model, I am agnostic to the number of competing platforms faced by Google, as long as there is at least one rival. Appendix 3 provides details regarding this derivation.

buyer side, and $\varepsilon_{OS,t}$ is own-brand elasticity of demand taken with respect to the take rate on the seller side). As in the foundational model, the competitive elasticity terms imply a lower take rate in this equation. Table 2 summarizes these equations, comparing the foundational framework with the extension that allows for a percentage take rate. Details of how these expressions are derived are in Appendix 3.

TABLE 2: EQUILIBRIUM EXPRESSIONS OF THE ROCHET-TIROLE MODEL APPLIED TO THE INSTANT CASE

Scenario	Foundational Model	Applied Model
Monopoly	$\frac{P_B + P_S - C}{P_B + P_S} = \frac{1}{\varepsilon_B + \varepsilon_S}$ (Eqn. (V.1))	$\frac{P_B + tS - C}{tS + t^2S'} = \frac{1}{\varepsilon_{B,t} + \varepsilon_{S,t}}$ (Eqn. (V.3))
Competitive	$\frac{P_B + P_S - C}{P_B + P_S} = \frac{1}{\varepsilon_{OB} + \varepsilon_{OS}}$ (Eqn. (V.4))	$\frac{P_B + tS - C}{tS + t^2S'} = \frac{1}{\varepsilon_{OB,t} + \varepsilon_{OS,t}}$ (Eqn. (V.5))

3. Calibrating the Model and Required Inputs

192. Once the model is "calibrated" in the sense that it relates the observed variables in the monopoly setting in Table 2 and solves for the unobserved variables, the model can be used to project Google's take rate in a competitive setting. I demonstrate impact by proceeding in two steps. *First*, I calibrate the Applied Model in the monopoly scenario by estimating inputs in the observed setting in which Google wields monopoly power in the Android App Distribution Market, thus satisfying Equation (V.3). The model's inputs are informed entirely by paid Apps in the Android App Distribution Market, as those are the only Apps that are priced and thus exhibit an observable own-price elasticity of demand. *Second*, I use the competitive inputs—namely, the take rate elasticities of demand—to determine a competitive take rate in a competitive (but-for) world, thus satisfying Equation (V.5). Data obtained from Google and other sources can be used in the applied monopoly and competitive models. In the descriptions below, I use the superscript ^{M} to denote inputs to the monopoly model (Equation (V.3)) and the superscript ^{C} to denote inputs to the competitive model (Equation (V.5)). My sources and methods for obtaining the monopoly scenario inputs shown in Equation (V.3) are:

- P_B^M is equal to the price "charged" by Google to consumers for transactions made on its platform in the monopoly scenario. Through its Play Point loyalty program and other promotions, Google effectively charges a small negative price to consumers. As it does in the actual world, Google would maximize its profits with respect to all Apps collectively, not App-by-App. Therefore, I use Google's average subsidy across all Apps, not individual subsidy amounts, to calculate P_B^M. I compute the value of this subsidy as the sum of all promotions paid by Google for paid Apps downloaded in the Android App Distribution Market divided by the total quantity of paid Apps downloaded in the Android App Distribution Market, per Google's transaction records.

- t^M is equal to the observed take rate, computed as the sum of all revenue retained by Google in the Android App Distribution Market divided by the sum of total revenue spent by consumers in the Android App Distribution Market. t^M therefore represents the portion of consumer spending that Google "takes" from the developer. I calculate t^M prior to extracting Google's promotional payments to consumers (promotional payments are captured by P_B^M).

- S^M is equal to the average price charged for Apps in the Android App Distribution Market (for paid App downloads only) in the monopoly setting.[387] In the monopoly model, S^M is total consumer expenditure (prior to receiving promotions from Google) in the Android App Distribution Market divided by the total quantity of paid Apps downloaded, as observed in Google's transaction records. As it does in the actual world, Google would maximize its profits with respect to all Apps collectively, not App-by-App. Therefore, I use Google's average App price across all Apps, not individual App prices, to calculate S^M.

- Marginal cost C represents the incremental cost incurred by Google in executing a transaction in the Android App Distribution Market or In-App Aftermarket. I refer to Google's financial data to infer this value, which suggests that transaction fees and direct costs that Google records for the Play Store (excluding content costs) are approximately [redacted] percent of consumer expenditures.[388]

- γ is equal to the change in the App price S charged to consumers with respect to a change in developers' costs (including the cost imposed on developers through Google's take rate), also known as the pass-through rate. This parameter is discussed in detail in Part V.D, where I estimate its value at approximately 90 percent (89.9 percent). This value implies that an increase in the take rate that adds $1.00 in extra cost to a developer will cause an increase in the price of the app product of $0.90. Mathematically, the pass-through rate is:

(V.6)
$$\gamma = \frac{\text{change in revenue}}{\text{change in costs}}$$

- S'^M represents the change in the product price resulting from a small change in the take rate. I solve for S'^M in terms of the take rate and pass-through rate: $S'^M = \frac{\gamma}{(1-t^M\gamma)}S^M$. Appendix 3 contains a derivation of this expression.

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387. Apps that are free to download have a zero price and are therefore excluded from the analysis.

388. As I discuss in Section V. C, I estimate that Google's direct costs of sales and direct operating expenses for the Play Store (excluding irrelevant content costs for movies, television, and books) to be [redacted] of consumer expenditures on the Play Store for the period 2016 – 2020. In addition to transaction fees, the Play Store's direct costs of sales includes content costs, customer support, and other costs. I include all of these except content costs; these are costs Google incurs for sales of books, movies, and television, and are not part of the relevant markets here. I also include all direct operating expenses, which include payroll & stock-based compensation, as well as the following non-payroll costs: professional services, advertising and promotional expenses, equipment, and other expenses (travel and entertainment, office and related expenses). *See* GOOG-PLAY-000416245.

- $\varepsilon_{B,t}^{M}$ and $\varepsilon_{S,t}^{M}$ are the take-rate elasticities of demand for transactions in the Android App Distribution Market from consumers and developers, respectively, in the presence of Google's monopoly. $\varepsilon_{B,t}^{M}$ reflects the change in the quantity demanded by consumers for Android App Distribution Market transactions associated with a change in the take rate in a monopoly setting. A change in the take rate affects the price at which App products (paid App downloads and purchases of In-App Content) are set via pass-through, which in turn affects consumer demand. $\varepsilon_{S,t}^{M}$ reflects the change in the number of paid Apps sold by developers in response to a change in the take rate in a monopoly setting. Given the other inputs to the monopoly model, the value of $\varepsilon_{B,t}^{M} + \varepsilon_{S,t}^{M}$ is implied by Equation (V.3). Further description of these inputs is included in Appendix 3.

I hold inputs C and γ fixed between the monopoly and competitive scenarios. My sources and methods for obtaining the remaining inputs to the competitive scenario expression shown in Equation (V.5) are:

- P_B^C is equal to the price "charged" by Google to consumers for transactions made on its platform in the competitive scenario. I hold the buyer-side platform price fixed in proportion to the product price: $P_B^C = \left(\frac{P_B^M}{S^M}\right) * S^C$.[389]

- t^C is equal to the but-for (competitive) take rate. I calculate the but-for take rate by finding the value that satisfies Equation (V.5) given the remaining inputs.[390]

- S^C is the price of paid App downloads that developers would charge in a competitive scenario. S^C can be inferred if the pass-through rate is known by using Equation (V.6). In particular, plugging in the change in revenue and change in costs associated with the monopoly versus a competitive scenario:

(V.7)
$$\gamma = \frac{\text{change in revenue}}{\text{change in costs}} = \frac{(S^M - S^C) * \text{quantity}}{(t^M S^M - t^C S^C) * \text{quantity}}$$

This expression can be further simplified and re-arranged to express the competitive price S^C in terms of other inputs:

(V.8)
$$S^C = S^M \frac{1 - \gamma t^M}{1 - \gamma t^C}$$

- S'^C represents the change in the product price resulting from a small change in the take rate in the competitive setting. I solve for S'^C in terms of the take rate and pass-through rate: $S'^C = \frac{\gamma}{(1 - t^C \gamma)} S^C$. Appendix 3 contains a derivation of this expression.

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389. In Section V.E, I model a scenario in which the locus of competition occurs on the buyer-side platform price P_B, resulting in a but-for buyer-side platform price that differs from the observed, monopolistic price.

390. If all the inputs to Equation (V.5) are known except for the take rate, I can solve for the take rate that satisfies the equation.

- $\varepsilon^{C}_{OB,t}$ and $\varepsilon^{C}_{OS,t}$ are the "own-brand" take-rate elasticities of demand for transactions in the Android App Distribution Market for consumers and developers, respectively, in the presence of competition. $\varepsilon^{C}_{OB,t}$ reflects the change in the quantity demanded by consumers for Android App Distribution Market transactions—from Google in particular, hence, "own-brand"—associated with a change in Google's take rate. Relative to its monopoly analogue, this parameter reflects a scenario where Google faces competition from rival platforms; as such, the parameter will be greater in magnitude than the monopoly elasticity, because the presence of a competitor allows easier defection by consumers in the presence of a price increase from Google, and thus more sensitivity. $\varepsilon^{C}_{OS,t}$ reflects the change in the quantity of transactions demanded by developers—on the Play Store in particular, hence "own-brand"—in response to a change in the take rate, again in the presence of platform (app store) competition. To inform the but-for competitive elasticities as shown in the denominator of Equation (V.5), $\varepsilon_{OB,t} + \varepsilon_{OS,t}$, I draw from the economics literature, empirical evidence of industries that have shifted from monopoly to competition. I conservatively estimate that Google's take rate elasticities shift from a value of 2.12 (in the monopoly setting, as calculated using Equation (V.3)) to 2.49 in the competitive setting. I arrive at 2.49 using the relationship between own-brand elasticity and market demand elasticity, and under the conservative assumption that Google maintains a 60 percent share of the Android App Distribution Market with an inelastic supply response from Google's rivals.[391] These inputs are defined mathematically in Appendix 3.

4. Competitive Take Rate Results

193. Table 3 summarizes the results of calculating inputs as described above. I estimate that in the but-for world, platform competition results in a competitive take rate of [redacted] percent, down from its observed value of [redacted] percent in the actual world.[392] This result is calculated from Equation (V.5), by finding the value for t that satisfies the equation, given all other inputs. As Table 3 shows, at a pass-through rate of $\gamma = 89.9$ percent, the resulting but-for average price of paid App downloads in the Android App Distribution Market is [redacted], down from the observed price of [redacted] (net of Google's promotional expenditures to consumers). This difference results in an average overcharge to consumers of [redacted] per paid App download = [redacted]

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391. Similar to Part V.C, *infra*, I use the relation $E_g = \frac{E_M}{S_g} + \frac{E_S(1-S_g)}{S_g}$ where E_g is Google's own-brand elasticity (reflecting price responses of both buyers and sellers), E_M is market elasticity, S_g is Google's market share, and E_S is the elasticity of supply of Google's rivals (conservatively set to zero). *See* Landes & Posner at 939-940. I conservatively assume Google maintains a 60 percent market share in a competitive market and that $E_S = 0$. AT&T saw its market share decline to approximately 60 percent by the early 1990s after losing its monopoly. *See, e.g.,* Simran Kahai, David Kaserman & John Mayo, *Is the "Dominant Firm" Dominant? An Empirical Analysis of AT&T's Market Power*, 39 JOURNAL OF LAW & ECONOMICS 499-517 (1996). This implies that buyer price elasticity of demand changes from 5.118 in the monopoly setting (estimated using Equation V.11) to 8.53 = 5.119/0.6 in the competitive setting, which translates to a competitive take rate elasticity of 2.276 (see Appendix 3 and Equation (A.19) for details on the relation between the buyer price elasticity of demand and buyer take rate elasticity of demand). I use Equation V.3 to calculate the seller (developer) take rate elasticity of demand at 0.213 in the monopoly setting. I conservatively hold the seller (developer) take rate elasticity of demand fixed at its monopoly level in the competitive (but-for) scenario The sum total of both competitive elasticities is then equal to 2.276 + 0.213 = 2.49.

392. A large portion of products sold in the Android App Distribution market were priced at either $0.99 or $1.99. When taking a 30 percent commission, Google's portion was rounded to the nearest penny (for example, taking $0.30 for a $0.99 purchase and $0.60 for a $1.99 purchase). This leads to an overall average take rate that is slightly greater than [redacted]

demonstrating impact, and it results in aggregate damages [redacted] (equal to [redacted] times 61.58 million paid App downloads sold)[393] as a result of Google's restrictions in the Android App Distribution Market, across the Class Period (August 16, 2016, through December 31, 2020). As explained below, there are additional damages and impact in the In-App Aftermarket.

194. Developer-specific take rates can be computed by applying the proportion of discounts granted in the actual world to the competitive but-for take rate. For example, suppose that the overall take rate is 30 percent in the actual world. Suppose a developer has an actual take rate of 29 percent (one percentage point below the overall rate). Suppose that the overall but-for take rate is 23 percent. In this example, the developer's but-for take rate would be calculated as [23 percent] x [29 percent]/[30 percent] = 22.2 percent. The pass-through rate γ (which I set equal to 89.9 percent for this analysis) may also vary across categories of Apps. Differential pass-through rates can be readily estimated using common methods and evidence (see Part V.D.3) and inserted into the model to determine competitive but-for take rates that vary across App category, as illustrated in Part VII below. Class members who made purchases in those App categories were accordingly subject to overcharges; lower take rates associated with consumer purchases in the but-for world would be passed through in the form of lower App prices relative to the actual world.

393. Equivalently, aggregate damages can be calculated as the percentage decrease in price (equal to [redacted]), multiplied by actual consumer expenditure of [redacted] (after Google's promotional expenditures), yielding aggregate damages of [redacted].

TABLE 3: ANDROID APP DISTRIBUTION MARKET IMPACT AND DAMAGES
(8/16/2016 – 12/31/2020)

Actual World (Monopoly, Eqn. (3))

#	Input	Description	Value	Source/Notes
[1]		Consumer Expenditure (US)	[redacted]	GOOG-PLAY-005535886 (US Consumers)
[2]		Google Revenue (US)		GOOG-PLAY-005535886 (US Consumers)
[3]		Google Promotional Expenditures (US)		GOOG-PLAY-005535886 (US Consumers)
[4]		Android App Distribution Market (Paid) Transactions (US)		GOOG-PLAY-005535886 (US Consumers)
[5]=[1]/[4]	S^M	App Product Price		Calculated
[6]=[2]/[1]	t^M	Take Rate		Calculated
[7]=-[3]/[4]	P_B	Buyer-side Platform Price		Calculated
[8]=[5]+[7]	$S^M + P_B$	App Product Price Net of Promotions		Calculated
[9]	C	Marginal Cost		GOOG-PLAY-000416245
[10]	γ	Pass-through Rate		Estimated (See Table 8)
[11]	$\varepsilon^M_{B,t} + \varepsilon^M_{S,t}$	Take Rate Elasticities of Demand		Calculated (Eqn. (V.3))

But-For World (Competitive, Eqn. (5))

#	Input	Description	Value	Source/Notes
[12]	S^C	App Product Price	[redacted]	Calculated (Eqn. (V.8))
[13]	t^C	Take Rate		Calculated (Eqn. (V.5))
[14]=([7]/[5])*[12]	P_B	Buyer-side Platform Price		Calculated
[15]=[12]+[14]	$S^C + P_B$	App Product Price Net of Promotions		Calculated
[16]=[9]	C	Marginal Cost		GOOG-PLAY-000416245
[17]=[10]	γ	Pass-through Rate		Estimated (See Table 8)
[18]	$\varepsilon^C_{OB,t} + \varepsilon^C_{OS,t}$	Take Rate Elasticities of Demand		Economic theory/empirical studies
[19]=[8]-[15]		Consumer Savings Per Transaction		Calculated
[20]=[19]*[4]		**Aggregate Damages**		Calculated

5. Analysis Of Similar Platforms Corroborates My Competitive Take Rates For Initial App Downloads

195. The framework described above demonstrates the economics of two-sided platforms and allows estimation of a take rate in a competitive but-for world. This model is particularly useful in the present context where the Challenged Conduct has been inherent to Google's business practices since approximately the inception of the Play Store, preventing a "before, during, and after" comparison. A comparative analysis, presented here, can be used to corroborate the results from the two-sided market model. In this section, I review take rates found in similarly situated, two-sided digital platforms. I focus on take rates from platforms where there are no (or fewer) anticompetitive restraints similar to those imposed by Google in the instant case, and the fundamentals of platform economics (connecting two sides of a market) are present. From these examples, several conclusions emerge:

- Platforms in competitive environments compete by lowering their take rates;
- Customer mobility, which hinges on the presence of substitutes and the absence of switching costs, puts downward pressure on the take rate via steering; and
- Take rates in competitive environments reflect the diminishing value offered by the platform over time following the initial matching of buyer and seller.

a. The ONE Store

196. South Korean wireless carrier SK Telecom Co. spearheaded the launch of the ONE Store, a competing mobile app store in 2016.[394] The scale of this effort to compete with Google is a testament to the barriers to entry: it involved cooperation among the three largest Korean wireless carriers (SK Telecom, KT, and LG Uplus), as well as Naver, Korea's largest search engine.[395] These parties were able to achieve near-universal availability in South Korea of the rival app store by having it pre-installed on every Android handset provided by these three companies.[396] The ONE Store now has a 14.9 percent share of payment volume among app stores in South Korea.[397] The ONE Store has managed to gain share of payment volume in large part thanks to its significantly lower take rates, as well as an aggressive points system for consumers. The ONE Store has a 20 percent take rate for developers, which is lowered to five percent if the developer uses its own payment platform.[398] ONE Store's CEO credits its lower take rates compared to Google's 30 percent rate with increasing ONE Store's presence in its domestic market and increasing the number of users purchasing app products (both paid App downloads and purchases

394. Lim Young-sin & Choi Mira, *Korea's home-grown integrated app market One Store on global outreach,* PULSE (Nov. 13, 2019), *available at* pulsenews.co.kr/view.php?year=2019&no=938924.

395. *Id.*

396. GOOG-PLAY-000005203 at GOOG-PLAY-000005264 ("Pre-installed on (virtually) every phone sold in SK").

397. Kim Eun-jung, *Korean app market ONE store eyes global alliance to compete with Google* (Dec. 1, 2019), *available at* en.yna.co.kr/view/AEN20191128004700320.

398. *Id.* ("ONE store cut the rate to 20 percent in July 2018. For app providers with their own payment platform, the firm only charged 5 percent for its service.").

of In-App Content).[399] In October 2020, ONE Store announced a 50 percent discount on commissions for small developers (those with revenue less than 5 million won per month).[400]

197. The ONE Store has been identified by Google as a competitive risk due to its lower take rate.[401] The ONE store originally charged a 30 percent commission from its launch in March 2016, and cut its take rate to the 20 percent level (five percent if developers provide their own payment platform) in July 2018 to compete against Google.[402] Developers can now (setting aside any restrictions by Google) steer their customers to the lower-cost platform via discounting prices to consumers for Apps. This episode demonstrates that multi-homing competition among app store platforms engenders competition along the take-rate dimension.

198. The scale of the alliance of the three largest wireless carriers in South Korea enabled the ONE Store to overcome the prohibitive restrictions to competition imposed by Google. [redacted][403] An internal Google presentation notes [redacted] is "[u]nlikely in the US, given market share distribution and competition amongst carriers."[404]

b. Aptoide

199. Aptoide, another app store operating worldwide, assesses a maximum take rate of 25 percent[405] and in some cases charges a take rate as low as ten percent.[406] These take rates encourage developers to steer their customers to Aptoide's lower-cost platform. This strategy has

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399. *Id.* ("The rate cut not only helped the firm [the ONE Store] to expand its presence in the domestic market but also improved profitability with an increased number of paid users, he said. . . With the additional firepower, Lee said ONE store will bolster efforts to create an alternative global app store capable of competing with Google and enhance the app industry ecosystem. 'A monopolistic market is not healthy for both industry players and consumers,' Lee said. 'We need more competition, not only in the domestic market but also on the global scale.'").

400. ET Telecom.com, *South Korea's app market ONE store grows amid Google's Play store policy row* (Feb. 21, 2021), *available at* telecom.economictimes.indiatimes.com/news/south-koreas-app-market-one-store-grows-amid-googles-play-store-policy-row/81135498. I have not endeavored to study the difference in App prices, if any, across the One Store and Google Play Store in South Korea. To the extent App prices have converged across the two platforms, that is consistent with pass-through and steering by developers, as one would expect a lower price for an App on the One Store to induce substitution that would put downward pressure on App prices in the Google Play Store.

401. *See, e.g.,* GOOG-PLAY-000005203 at GOOG-PLAY-000005215. *See also* GOOG-PLAY-000445443 at GOOG-PLAY-000445451.

402. Kim Eun-jung, *Korean app market ONE store eyes global alliance to compete with Google* (Dec. 1, 2019), *available at* en.yna.co.kr/view/AEN20191128004700320.

403. *See, e.g.,* GOOG-PLAY-007315383 ([redacted]); GOOG-PLAY-001055565 ([redacted]). *See also* GOOG-PLAY-001143425 ([redacted]).

404. GOOG-PLAY-002011285 at GOOG-PLAY-002011289.

405. *See* Aptoide, *For Developers*, *available at* en.aptoide.com/company/developers ("Get a minimum of 75% payout rate on in-app purchases in comparison to 70% or even 50% you get with other app distributors.").

406. *See* Revenue Share, Catappult App Distribution Console, *available at* docs.catappult.io/docs/distribution-and-revenue-share.

paid off; Aptoide presently has over 300 million users worldwide.[407] Aptoide's growth is nevertheless limited by Google's restrictions—for example, consumers cannot download Aptoide through the Google Play Store and instead must go through the cumbersome side-loading process.[408] Moreover, developers are also barred from any form of steering—that is, informing consumers using the Google Play Store that they can use Aptoide for some or all of their transactions.[409]

c. Amazon

200. [redacted] Google's documents indicate that Amazon ran significant promotions on the user side. For instance, Google's 2017 [redacted] indicates that [redacted][411] Amazon announced in June 2021 that it will reduce its headline take rate from 30 percent to 20 percent for small developers with less than $1 million in revenues, similar to other platforms.[412] Further, Amazon will offer promotional Amazon Web Services credits that could effectively cut its take rate to 10 percent.[413]

d. PC Game Platforms

201. Despite not being a participant in the Android App Distribution Market, video game distribution platforms on PCs are similar to mobile App distribution platforms in that they also connect developers of software applications to consumers without requiring a particular console

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407. *See* Aptoide, *About Us, available at* en.aptoide.com/company/about-us ("Aptoide is the game-changing Android App Store. With over 300 million users, 7 billion downloads and 1 million apps, Aptoide provides an alternative way to discover apps and games, with no geo-restrictions and one of the best malware detection systems in the market.").

408. Aptoide, *How to download and install Aptoide?, available at* en.aptoide.com/company/faq/how-to-download-install-aptoide.

409. *See* Google – Play Console Help, *Understanding Google Play's Payments policy*, *available at* support.google.com/googleplay/android-developer/answer/10281818?hl=en#zippy=%2Ccan-i-distribute-my-app-via-other-android-app-stores-or-through-my-website%2Ccan-i-communicate-with-my-users-about-alternative-ways-to-pay%2Ccan-i-communicate-with-my-users-about-promotions-on-other-platforms ("Within an app, developers may not lead users to a payment method other than Google Play's billing system unless permitted by the Payments policy. This includes directly linking to a webpage that could lead to an alternate payment method or using language that encourages a user to purchase the digital item outside of the app.").

410. Derek Strickland, *Apple's 30% App Store commission is 'supracompetitive,' court declares*, TWEAKTOWN (Sept. 11, 2021), *available at* www.tweaktown.com/news/81567/apples-30-app-store-commission-is-supracompetitive-court-declares/index.html. *Epic Games, Inc. v. Apple Inc.*, Case No.: 4:20-cv-05640-YGR, Rule 52 Order After Trial On The Merits (Sept. 10, 2021), at 98. [redacted].

411 GOOG-PLAY-000879194.R at GOOG-PLAY-000879204.R.

412. Sarah Perez, *Amazon's Appstore lowers its cut of developer revenue for small businesses, adds AWS credits*, TECHCRUNCH (June 17, 2021), *available at* techcrunch.com/2021/06/17/amazons-appstore-lowers-its-cut-of-developer-revenue-for-small-businesses-adds-aws-credits/.

413. Mike Peterson, *Amazon following Apple & Google's lead, cutting app store commissions*, APPLEINSIDER (June 17, 2021), *available at* appleinsider.com/articles/21/06/17/amazon-following-apple-googles-lead-cutting-app-store-commissions.

(like an Xbox or PlayStation).[414] The three dominant platforms through which PC games are bought and sold are Steam, Epic, and Microsoft.[415] Indeed, Google has noted that a 20 percent take rate would bring [redacted][416] although relatively recent developments suggest even lower take rates among PC game platforms. The Epic Games Store was launched in December 2018 with a take rate of 12 percent.[417] Microsoft announced a reduction from 30 percent to 12 percent for games sold through its store, beginning August 1, 2021.[418] Effective October 2018, Steam also announced a take-rate reduction from 30 percent to a tiered system: 30 percent for the developer's first $10 million in revenue, 25 percent for sales between $10 and $50 million, and 20 percent for sales more than $50 million.[419] [redacted][420]

e. PC App Stores

202. Effective August 1, 2021, Microsoft charged a 12 percent take rate for consumer non-game apps sold in the Microsoft Store (on devices other than Xbox and those using Windows 8), reduced from 15 percent.[421] Importantly, these commissions only apply when the developer is using the Microsoft commerce platform to "support the purchase of your App or any in-App Products" (analogous to Google's billing system).[422] Also as of August 1, 2021, Microsoft charged a *zero* percent take rate for non-game apps downloaded through the Windows 11 Store if the developer chose to use its own or a third-party commerce platform to facilitate in-app purchases.[423]

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414. Take rates for video games played on consoles such as Xbox and Playstation may reflect the cost recovery of the hardware.

415. Steam is estimated to control roughly three quarters of PC gaming sales, followed by Epic (between two and 15 percent) and Microsoft. *See, e.g.,* Kyle Orland, *Humble Bundle creator brings antitrust lawsuit against Valve over Steam*, ARS TECHNICA (Apr. 30, 2021), *available at* arstechnica.com/gaming/2021/04/humble-bundle-creator-brings-antitrust-lawsuit-against-valve-over-steam/.

416. GOOG-PLAY-000542516 at GOOG-PLAY-000542529.

417. Epic Games, *The Epic Games store is now live* (Dec. 6, 2018), *available at* www.epicgames.com/store/en-US/news/the-epic-games-store-is-now-live ("The Epic Games store is now open, featuring awesome high-quality games from other developers. Our goal is to bring you great games, and to give game developers a better deal: they receive 88% of the money you spend, versus only 70% elsewhere. This helps developers succeed and make more of the games you love.").

418. Tom Warren, *Microsoft shakes up PC gaming by reducing Windows store cut to just 12 percent*, THE VERGE (Apr. 29, 2021), *available at* www.theverge.com/2021/4/29/22409285/microsoft-store-cut-windows-pc-games-12-percent.

419. Brittany Vincent, *Valve Introduces New Revenue Split Changes For Steam Sales,* VARIETY (Dec. 3, 2018), *available at* variety.com/2018/gaming/news/valve-revenue-split-changes-1203078700/.

420. GOOG-PLAY-007329076 at GOOG-PLAY-007329084.

421. Microsoft Store, *App Developer Agreement Version 8.7* (Effective July 28, 2021), *available at* query.prod.cms.rt.microsoft.com/cms/api/am/binary/RE4OG2b ("Fifteen percent (15%) of Net Receipts for any Apps (and any In-App Products in such Apps, including) that are not listed in Section 6(b)(iii) below. ii. For all Net Receipts generated on or after August 1, 2021: Twelve percent (12%) of Net Receipts for any Games (and any in-App Products in such Games) that are not listed in Section 6(b)(iii). iii. Thirty percent (30%) of Net Receipts for: 1. all Apps and In-App Products acquired by Customers in the Microsoft Store on an Xbox console and billed to such Customers on a non-subscription basis; 2. all Games (and In-App Products in Games) acquired by Customers in the Microsoft Store on an Xbox console; and 3. all Apps and In-App Products acquired by Customers in the Microsoft Store on Windows 8 devices; or Microsoft Store on Windows Phone 8 devices.").

422. *Id.* at 13-14 ("Commerce Platform Requirements. Purchases made on a third-party commerce engine are not subject to the Store Fee, but are still required to comply with our Certification Requirement.").

423. Giorgio Sardo, General Manager – Microsoft Store, *Building a new, open Microsoft Store on Windows 11*, MICROSOFT WINDOWS BLOGS (Jun. 24, 2021), *available at* blogs.windows.com/windowsexperience/2021/06/24/building-a-new-open-microsoft-store-on-windows-11/.

More specifically, the Microsoft Store charges game developers 12 percent of revenue; non-game app developers pay 15 percent of revenue if they use Microsoft platform for their in-app transactions, but zero percent if they do not:

> Many developers love the Microsoft Commerce platform because of its simplicity, global distribution, platform integration and its competitive revenue share terms at 85/15 for apps and 88/12 for games. Starting July 28, app developers will also have an option to bring their own or a third party commerce platform in their apps, and if they do so they don't need to pay Microsoft any fee. **They can keep 100% of their revenue**."[424]

203. The Microsoft PC app store faces competition from direct downloads—consumers can easily discover a new application on the Internet and download it to the personal computer without using Microsoft as an intermediary. Given the competition from direct app downloads, Microsoft only charges a take rate when the services of matchmaking—connecting the consumer to the app—and billing services are provided.

f. Other Examples

204. Additional examples of take rates more competitive than Google's abound in other, similarly situated industries with two-sided platforms. In independent online publishing, one of the leading platforms, Substack, which brings together writers and readers, takes a ten percent commission from writers, recognizing the low switching costs: "Moving one's email list away from Substack is simple, so the firm lets writers keep 90% of their revenues."[425] This ease of mobility increases writers' elasticity of supply, which puts downward pressure on the take rate. Revue, a competitor to Substack now owned by Twitter, charges only a five percent take rate.[426] Google's own Chrome web store, which provides extensions, themes, and apps associated with its browser, charges a five percent take rate, recognizing the value of attracting developers who might otherwise produce content for other browsers.[427] Take rates for online retail from vendors such as

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424. *Id.* (emphasis added); *see also* Alex Hern, *Microsoft to let developers keep all their Windows app store revenue*, THE GUARDIAN (June 25, 2021), *available at* www.theguardian.com/technology/2021/jun/25/microsoft-let-developers-keep-all-windows-app-store-revenue#:~:text=Currently%2C%20developers%20who%20sell%20apps,the%20revenue%20with%20the%20company. ("As part of the shift to Windows 11, unveiled on Thursday, the company will allow developers to use their own payment systems on apps they sell through the Windows store. Those who do will not have to pay a penny to Microsoft."). Thus far, Microsoft has declined to unbundle its billing system for game developers: "A different set of rules apply for game developers: their share is lower, at 12%, but they will not be given the option of using their own payment processors." *Id.*

425. *The new rules of the 'creator economy'*, ECONOMIST (May 8, 2021), *available at* www.economist.com/briefing/2021/05/08/the-new-rules-of-the-creator-economy.

426. Max Willens, *Cheat sheet: Twitter's acquisition of Revue heats up the battle of the inbox*, DIGIDAY (Jan. 27, 2021), *available at* digiday.com/media/cheat-sheet-twitters-acquisition-of-revue-heats-up-the-battle-of-the-inbox/ ("Revue will remain a separate brand, but Twitter will provide the resources to make Revue more competitive with other newsletter platforms; the commission Revue takes on all consumer revenue has been reduced to 5%, half of what Substack charges. All of the Pro features for Revue will be freely available to all Revue users as well. Twitter will also help Revue hire more people across research, design and engineering.").

427. D. Melanson, *Google makes Chrome Web Store available worldwide, adds in-app purchases and flat five percent fee,* ENGADGET (May 11, 2011), *available at* www.engadget.com/2011-05-11-google-makes-chome-web-store-available-worldwide-adds-in-app-pu.html.

Amazon, eBay, and Etsy range from eight to fifteen percent with a small additional lump sum on the order of $0.30-$0.99.[428]

205. Table 4 offers a non-comprehensive summary of take rates in comparable competitive digital platform environments. Google's competitive but-for take rate from my two-sided platform model of [redacted] percent is corroborated by rates charged by competitive mobile app stores (18 to 25 percent), and is conservative compared to the take rates imposed by other platforms in more competitive industries. Finally, take rates of [redacted] and others) to adopt Google Play Billing in their apps.[429] It therefore provides a valid competitive benchmark take rate for developers with take rates at (or close to) Google's standard 30 percent take rate in the actual world (that is, the vast majority of developers).[430]

428. *See, e.g.,* Hung Truong, *Compare 9 Online Marketplace Fees* (Sept. 18, 2018), *available at* sellerzen.com/compare-9-online-marketplace-fees.

429. PX693, at GOOG-PLAY-000578301.R. *See, also* Defendants' Responses and Objections to Developer Plaintiffs' First Set of Interrogatories at 13 ([redacted] *See* Rosenberg Dep. at 261:11-262:4. [redacted] *See, e.g.,* GOOG-PLAY-000338849 at GOOG-PLAY-000338888; GOOG-PLAY-004714797; GOOG-PLAY-004717237; Defendants' Responses and Objections to Developer Plaintiffs' First Set of Interrogatories at 14-15; GOOG-PLAY-0006998204.R at GOOG-PLAY-0006998206.R. [redacted] (*see* GOOG-PLAY-000442329 at GOOG-PLAY-000442345- GOOG-PLAY-000442346; GOOG-PLAY-004717237) [redacted] (see GOOG-PLAY-000338849 at GOOG-PLAY-000338888; GOOG-PLAY-006998204.R at GOOG-PLAY-0006998206.R).

430. As explained in n. 376, *supra*, the relatively few developers who paid reduced take rates in the actual world would also have paid reduced take rates relative to the overall but-for take rate. For example, [redacted] would have more options for billing services than a typical developer in the but-for world, just as it does in the actual world.

TABLE 4: BENCHMARK TAKE RATES

Category	Benchmark		Comparable Take Rate
Mobile App Stores	(1)	Aptoide	10-25%
	(2)	ONE Store	5-20%
	(3)	Amazon	18%
PC App Stores	(4)	Microsoft (non-games)	12-15%
PC Games	(5)	Steam (Valve)	20-30%
	(6)	Epic	12%
	(7)	Microsoft Store	12% effective 8/1/2021
Online Retail	(8)	Amazon	8-15% + $0.99/item or $39.99/month
	(9)	eBay	12.55% + $0.35
	(10)	Etsy	8% + $0.45
	(11)	Google	0% (previously 5-15%)
	(12)	Poshmark	20% (for over $15, $2.95 flat fee for under $15 sale)
	(13)	Walmart	6-15%
Online Publishing	(14)	Substack	10% + credit card fee
	(15)	Revue (Twitter)	5%

Sources: (1) Aptoide – Catappult, *Revenue Share*, *available at* docs.catappult.io/docs/distribution-and-revenue-share (2) Korean app market ONE store eyes global alliance to compete with Google (Dec. 1, 2019), *available at* en.yna.co.kr/view/AEN20191128004700320; GOOG-PLAY-007329076 at GOOG-PLAY-007329084 (showing a 20 percent take rate, originally at 30 percent); (3) Derek Strickland, *Apple's 30% App Store commission is 'supracompetitive,' court declares*, TWEAKTOWN (Sept. 11, 2021), *available at* www.tweaktown.com/news/81567/apples-30-app-store-commission-is-supracompetitive-court-declares/index.html. (showing Amazon's effective take rate of 18.1%); (4) Microsoft Store App Developer Agreement Version 8.7 (Effective July 28, 2021), *available at* query.prod.cms.rt.microsoft.com/cms/api/am/binary/RE4OG2b; (5) Brittany Vincent, *Valve Introduces New Revenue Split Changes For Steam Sales*, VARIETY (Dec. 3, 2018), *available at* variety.com/2018/gaming/news/valve-revenue-split-changes-1203078700/; (6) Epic Games, *The Epic Games store is now live* (Dec. 6, 2018), *available at* www.epicgames.com/store/en-US/news/the-epic-games-store-is-now-live; (7) Tom Warren, *Microsoft shakes up PC gaming by reducing Windows store cut to just 12 percent*, THE VERGE (Apr. 29, 2021), *available at* www.theverge.com/2021/4/29/22409285/microsoft-store-cut-windows-pc-games-12-percent; (8) Amazon, *Let's talk numbers*, *available at* sell.amazon.com/pricing; (9) eBay, *Understanding selling fees, available at* pages.ebay.com/seller-center/get-started/seller-fees.html; (10) Etsy, *Sell, available at* www.etsy.com/sell (Etsy charges a $0.20 listing fee. When a product is sold, they charge a 5% transaction fee, paired with a 3% + $0.25 payment processing fee); (11) Google Merchant Center Help, *New 0% commission fee for selling on Google through Shopping Actions in the US* (July 23, 2020), *available at* support.google.com/merchants/answer/9977875?hl=en; Bryan Falla, *Google Shopping Actions Commission Rates*, GODATAFEED (Oct. 22, 2019), *available at* www.godatafeed.com/blog/google-shopping-actions-commission-structure; (12) Poshmark, *What are the fees for selling on Poshmark, available at* support.poshmark.com/s/article/297755057?language=en_US; (13) Walmart Marketplace, *Referral Fees, available at* marketplace.walmart.com/referral-fees/; (14) Substack, *Going Paid, available at* substack.com/going-paid; (15) Tom McKay, *Twitter Wants to Be Substack Now*, GIZMODO (Jan. 26, 2021), *available at* gizmodo.com/twitter-wants-to-be-substack-now-1846136057.

C. Removing Google's In-App Aftermarket Restrictions Would Put Downward Pressure on the Take Rate Google Imposes on Developers for In-App Content

206. Relative to the value provided by the developer, the value that the Play Store contributes by matching a consumer with an App dissipates over time. That is because once a consumer has found an App on the Play Store, the match has been made. Any value added through

the purchase of In-App Content is added entirely by the developer. Google's own documents recognize this.[431]

207. I understand that all of the In-App Aftermarket services that developers are currently forced to use from Google (owing to Google's In-App Aftermarket restrictions) can actually be performed by a third party or the developer itself completely independently of Google. For example, there exists a well-established industry of competitive payment processors in the business of facilitating online transactions.[432]

208. In the competitive but-for world without Google's restrictions, developers could choose their own provider of services in the In-App Aftermarket. Alternatively, developers would be able to offer consumers the choice of selecting from an array of competitive options to provide In-App Aftermarket Content. Elementary economics dictates that this would place downward pressure on Google's take rate, pushing it closer to the marginal cost of providing any services associated with In-App Content. Developers having the ability to steer consumers to lower-cost competitors would reinforce this downward pressure, [redacted][433] As explained below, standard economic methods common to the Class can be used to conservatively estimate the extent to which Google's take rate for services in delivering In-App Content would fall when Google's restrictions are removed.

1. A Standard Economic Model of Competition in the In-App Aftermarket

209. To the extent that a competitive In-App Aftermarket would be characterized by homogenous commodity services (payment for and distribution of In-App Content) offered by various competitive rivals with few barriers to entry or expansion, standard economic principles prescribe that Google would be unable to charge a premium for these services.[434] If Google attempted to charge developers anything in excess of the competitive market price for In-App Aftermarket services, then developers would switch to a competitor providing identical services at lower cost, rendering Google's attempted price increase unprofitable.[435] Thus, to the extent that the competitive In-App Aftermarket is characterized by competition for a commoditized service, Google's equilibrium take rate in the In-App Aftermarket would fall to the marginal cost of serving that market. As explained below, my economic model of the In-App Aftermarket conservatively allows Google to charge a substantial markup above marginal cost, even in a more competitive world.

210. Record evidence shows that Google's 30 percent take rate in the In-App Aftermarket cannot be justified by the costs of serving that market. As early as 2009, Google recognized that [redacted] and noted that [redacted][436] In another document, Google

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431. *See, e.g.,* GOOG-PLAY-003335786 at GOOG-PLAY-003335805 ([redacted]).

432. *See, e.g.,* Jonas DeMuro & Brian Turner, *Best payment gateways of 2021*, TECH RADAR (Apr. 20, 2021), *available at* www.techradar.com/best/best-payment-gateways; *see also* Table 7 below (listing various competitive payment processors).

433. *See* Part V.C.2 below; *see also* GOOG-PLAY-006829073.R at GOOG-PLAY-006829085.R (assessing [redacted]).

434. *See, e.g.,* MANKIW at 268-284.

435. *Id.*

436. GOOG-PLAY-004630018.R at GOOG-PLAY-004630024.R.

[redacted] and showed [redacted]

211. Financial data produced by Google allow me to estimate the Play Store's global transaction costs as a percentage of global customer spend in the In-App Aftermarket and the Android App Distribution Market (Google's financial data do not distinguish between the two markets).[441] In 2020, Google incurred worldwide aggregate transaction fees—including from credit cards, direct carrier billing, chargebacks, and gift cards—totaling [redacted][442] In that same year, Google's global revenue from commissions earned in the In-App Aftermarket and the Android App Distribution Market came to [redacted][443] Although the Play Store's financials do not include consumer expenditures, the consumer expenditures that gave rise to this revenue can be estimated at [redacted][444] Total transaction fees as a percentage of consumer spend on the Play Store is therefore [redacted]. I obtain a similar result ([redacted]) if I apply the same calculations to the Play Store's aggregate financials over the most recently available five-year period (2016-2020).[445]

212. Even if I expand the calculation to include all the direct costs of sales that Google records for the Play Store (excluding irrelevant content costs for movies, television, and books), as well as all direct operating expenses, I calculate all of these costs came to [redacted] percent of consumer expenditures on the Play Store for the period 2016 – 2020.[446] Accordingly, Google's cost of providing In-App Aftermarket services can be conservatively estimated at [redacted] percent

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437. GOOG-PLAY-006829073 at GOOG-PLAY-006829079.

438. GOOG-PLAY-006829073.R at GOOG-PLAY-006829097.R.

439. *Id.* at GOOG-PLAY-006829076.R ([redacted] *Id.* at GOOG-PLAY-006829075.R.

440. GOOG-PLAY-007617587 ("Summary" tab); *see also* [redacted]).

441. GOOG-PLAY-000416245. Because these are global financial data, they are not comparable to the revenue statistics in Table 3 above and in Table 5 below, which are limited to the United States.

442. GOOG-PLAY-000416245.

443. *Id.* Excludes irrelevant revenue streams such as movies, books, and television.

444. According to App Revenue Metrics data produced by Google, Google's overall take rate in the In-App Aftermarket and the Android App Distribution Market came to [redacted] in 2020. *See* GOOG-PLAY-005535887; GOOG-PLAY-005535886.

445. GOOG-PLAY-000416245.

446. In addition to Transaction Fees, the Play Store's Direct Costs of Sales includes Content Costs, Customer Support, and Other. I include all of these except Content Costs; these are costs Google incurs for sales of books, movies, and television, and are not part of the relevant markets here. I also include all Direct Operating Expenses, which include Payroll & Stock-based Comp (SBC), as well as the following Non-Payroll costs: Prof Services, A&P, Equipment, and Other (T&E, Office & Related). *Id.*

of consumer expenditures.[447] This implies that Google's standard 30 percent take rate vastly exceeds its marginal costs ([redacted] percent of revenues), confirming that Google is exercising market power.

213. Google may argue that it would have retained some brand loyalty in the In-App Aftermarket, conferring a degree of pricing power in a competitive world, and thus a deviation from homogenous-product competition contemplated above. In that case, standard economics shows that Google's profit-maximizing price for In-App Aftermarket services would be determined by Google's firm-specific price elasticity of demand (as well as marginal costs).[448] The firm-specific demand elasticity is the percentage decrease in demand for Google's In-App Aftermarket services resulting from a one percent increase in price.[449] Google's profit-maximizing price for In-App Aftermarket services is given by the standard inverse elasticity formula, shown in the equation below.[450]

$$(P-C)/P = 1/E_g \tag{V.9}$$

where E_g represents Google's firm-specific demand elasticity for In-App Aftermarket services, P represents the price for In-App Aftermarket services, and C represents Google's marginal cost of providing In-App Aftermarket services. It bears noting that this elasticity of demand for Google's In-App Aftermarket services (Google Play Billing) is different from the elasticities of demand used in the two-sided model of the Android App Distribution Market for the Play Store.

214. As explained in Landes and Posner's seminal paper, Google's firm-specific demand elasticity is related to the market demand elasticity as follows:[451]

$$E_g = E_M / S_g + E_s (1 - S_g) / S_g \tag{V.10}$$

Above, E_M is the market demand elasticity for In-App Aftermarket services—that is, the percentage decrease in the market-wide quantity demanded resulting from a one percent market-wide increase in price. The term E_s is the elasticity of supply of Google's rivals—that is, the percentage increase in the quantity supplied by Google's rivals, given a one percent increase in Google's price. Finally, S_g is Google's market share. For example, if Google's market share is 100 percent ($S_g = 1$), the equation collapses to $E_g = E_M$. In that scenario, Google's firm-specific elasticity is the same as the market elasticity, because Google would be a monopolist (in the strict economic sense of being literally the only supplier). In contrast, when Google's market share falls below 100 percent, its firm-specific demand elasticity exceeds the market demand elasticity. By the standard

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447. Google's cost of providing In-App Aftermarket services is certainly no more than fifteen percent of consumer expenditures, the rate that Google charges to all subscription Apps, effective January 1, 2022. *See* Sameer Samat - Vice President, Product Management, *Evolving our business model to address developer needs*, Android Developers Blog (Oct. 21, 2021), *available at* android-developers.googleblog.com/2021/10/evolving-business-model.html ("To help support the specific needs of developers offering subscriptions, starting on January 1, 2022, we're decreasing the service fee for all subscriptions on Google Play from 30% to 15%, starting from day one.").

448. *See, e.g.,* Landes & Posner at 939-940.

449. *Id.*

450. *Id. See also* Jerry Hausman & Greg Leonard, *Efficiencies from the Consumer Viewpoint,* 17(3) GEORGE MASON LAW REVIEW 707, 709 (1999) [hereafter Hausman & Leonard].

451. Landes & Posner at 944-945.

inverse-elasticity formula in equation V.9 above, Google's profit-maximizing price under competition is lower than the monopoly price for In-App Aftermarket services.

215. In the actual world, Google's share of the In-App Aftermarket is close to 100 percent,[452] because Google has prevented competitive entry by forcing developers to purchase from Google In-App Aftermarket services (authorization of In-App Content and payment processing), typically priced at 30 percent of developers' In-App Aftermarket revenue. In a competitive but-for world, elementary economic principles dictate that competitors would enter the market and charge a lower take rate to developers, diverting business from Google and pushing Google's price downward toward marginal cost.[453]

216. Economists have demonstrated empirically that previously monopolistic (or dominant) firms faced with competitive entry lose both market share and pricing power. For example, when AT&T lost its monopoly in long-distance telephone service pursuant to a 1982 divestiture order, it lost substantial market share, and long-distance telephone prices fell substantially, despite any brand loyalty that AT&T may have enjoyed over other long-distance entrants such as MCI.[454] In an article published in the *Journal of Law & Economics*, the authors found that AT&T, which had previously enjoyed a government-sanctioned monopoly, saw its market share decline to approximately 60 percent by the early 1990s.[455] The supply elasticity of AT&T's competitors was estimated at 4.38, consistent with evidence that barriers to entry and expansion in the long-distance market were relatively low during the post-divestiture period.[456] Applying equation V.10 above, the authors calculated that AT&T's firm-specific demand elasticity at between 3.73 and 7.81, which implied price-cost markups of between 13 and 29 percent.[457] These markups are below those found in a range of other industries throughout the economy, indicating that competition had substantially eroded AT&T's market power in the interstate long-distance market.[458] In the absence of competition, AT&T's profit-maximizing prices for long-distance service would have been substantially higher, particularly given that market demand for long-distance service is relatively insensitive to price.[459]

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452. *See, e.g.*, Android Developers Blog, *Listening to Developer Feedback to Improve Google Play* (Sept. 28, 2020), *available at* android-developers.googleblog.com/2020/09/listening-to-developer-feedback-to.html ("Less than 3% of developers with apps on Play sold digital goods over the last 12 months, and of this 3%, the vast majority (nearly 97%) already use Google Play's billing. But for those who already have an app on Google Play that requires technical work to integrate our billing system, we do not want to unduly disrupt their roadmaps and are giving a year (until September 30, 2021) to complete any needed updates. And of course we will require Google's apps that do not already use Google Play's billing system to make the necessary updates as well.").

453. *See, e.g.*, MANKIW at 270-282.

454. *See, e.g.,* Simran Kahai, David Kaserman & John Mayo, *Is the "Dominant Firm" Dominant? An Empirical Analysis of AT&T'S Market Power*, 39 JOURNAL OF LAW & ECONOMICS 499-517 (1996) [hereafter Kahai et al.]. *See also* Jeffrey Eisenach and Kevin Caves, *What Happens When Local Phone Service Is Deregulated?* REGULATION 34-41 (2012) at 35 ("There is no disagreement, however, that long distance prices have fallen sharply since liberalization. As shown in Figure 1, in real terms, the price of long-distance service fell by more than 70 percent between 1984 and 2006.").

455. Kahai et al. at 510. This reflects AT&T's output-based market share. Its asset-based market share was even lower, at approximately 40 percent. *Id.*

456. *Id*. at 508.

457. *Id*. at 510 ("The corresponding values of the Lerner index…are 0.29 and 0.13.").

458. *Id.* at 510-513.

459. *Id*. at 509 (reporting market demand elasticities between 0.49 and 0.75).

217. Similarly, an econometric analysis of the historically dominant Aluminum Company of America (Alcoa) found that Alcoa's pricing power declined significantly in the postwar period, despite substantial barriers to entry and expansion by competitive rivals.[460] The authors estimated the supply elasticity for Alcoa's rivals in the aluminum industry at just 1.4.[461] This was indicative of the substantial capital requirements for primary aluminum producers,[462] and particularly the "extraordinarily high" cost of entry at an efficient scale.[463] Nevertheless, Alcoa's residual demand elasticity was estimated at 8.3, indicating that Alcoa's pricing power, much like AT&T's, had substantially eroded.[464] The authors used the same formula given in equation V.10 above to estimate Alcoa's residual demand elasticity: The market demand elasticity for aluminum was estimated at 2.0.[465] Alcoa's capacity-based market share was approximately 35 percent during the relevant time period.[466] Applying equation V.10, this resulted in a relatively high firm-specific elasticity for Alcoa of 8.3.[467] This relatively high price sensitivity yields a correspondingly low price-cost markup of 12 percent.[468] The authors concluded that, despite the supply constraints faced by Alcoa's rivals, "the aluminum industry has entered a much more competitive market structure in the post-war period."[469] In the absence of competitive entry, Alcoa would have been able to command price-cost markups of approximately 50 percent (equal to $1/E_M = 1/2.0$) rather than 12 percent.

218. I apply this same standard economic framework to modeling the but-for take rate in the In-App Aftermarket. These calculations are summarized in Table 5. As seen below, U.S. consumer expenditures in the In-App Aftermarket came to [redacted] between mid-August 2016 (the beginning of the Class Period) and the end of 2020. Over this timeframe, Google collected [redacted] in U.S. commissions, resulting in a take rate in the actual world of [redacted] Total U.S. transaction volume was [redacted] implying an average consumer price per transaction of [redacted].[470] Google received [redacted] percent of this price, or [redacted] per transaction. Google's marginal cost per transaction is conservatively estimated at [redacted] percent of the average consumer price, or [redacted] per transaction, which yields a markup of price over cost of 64.7 percent. By the equation (V.9) above, Google's own-firm elasticity in the In-App Aftermarket is [redacted] I obtain a comparable result of [redacted] if I estimate Google's own-firm elasticity econometrically; here I conservatively use the lower of the two elasticity estimates.[471] By equation

460. Sheng-Ping Yang, *Identifying a dominant firm's market power among sellers of a homogeneous product: an application to Alcoa*, 34 APPLIED ECONOMICS 1411-1419 (2002).

461. *Id.* at 1416.

462. *Id.* at 1412.

463. *Id.* at 1418.

464. *Id.* at 1417.

465. *Id.* at 1416.

466. *Id.* at 1417.

467. Equal to 2.0/0.35 + 1.4*(1 - 0.35)/0.35.

468. Equal to 1/8.3 = 0.12.

469. *Id.* at 1418.

470. Average revenue is mathematically equivalent to price per unit. *See, e.g.,* MANKIW at 270 ("Average revenue is total revenue (P x Q) divided by the quantity (Q). *Therefore, for all types of firms, average revenue equals the price of the good*.") (emphasis in original).

471. In Appendix 5, I empirically estimate Google's actual-world own-firm demand elasticity for the In-App Aftermarket at [redacted]. My results are not highly sensitive to using this estimate, instead of the own-price elasticity of [redacted] calculated here. Aggregate damages would increase by approximately [redacted] percent if I were to use [redacted] instead of [redacted] as the own-firm demand elasticity. Here I conservatively employ the [redacted] estimate.

(V.10) above, the market demand elasticity in the In-App Aftermarket is [redacted].[472] The values of these inputs in the actual world are summarized in the first panel of Table 5 below.

TABLE 5: IN-APP AFTERMARKET IMPACT & DAMAGES (US, 8/16/2016 – 12/31/2020)

#	Input	Value	Source/Notes
Actual World			
[1]	Consumer Expenditure (US; Net of Discounts)	[redacted]	GOOG-PLAY-005535886 (US Consumers; net of discounts)
[2]	Google Revenue (US)		*Id.*
[3] = [2]/[1]	Take Rate		Calculated
[4]	Quantity (Transactions)		GOOG-PLAY-005535886 (US Consumers)
[5] = [1]/[4]	Consumer Price		Calculated
[6] = [5]*[3]	Google Price		Calculated
[7] = 0.1029*[5]	Google Marginal Cost		GOOG-PLAY-000416245 (equal to 10.29 percent of consumer expenditure. Includes all Direct COS & Direct OpEx)
[8] = ([6] - [7])/[6]	Google Margin		Calculated
[9] = 1/[8]	Google Own-Firm Demand Elasticity		Calculated
[10]	Google Market Share		*See, e.g.*, android-developers.googleblog.com/2020/09/listening-to-developer-feedback-to.html
[11] = [10]*[9]	Market Demand Elasticity		Calculated
Absent Google's Restrictions			
[12]	Google Market Share	[redacted]	Economic principles/empirical studies
[13]	Competitor Supply Elasticity		Economic principles/empirical studies
[14] = [11]/[12] + [13]*[1 - 12]/[12]	Google Own-Firm Demand Elasticity		Calculated
[15] = 1/[14]	Google Margin		Calculated
[16] = [7]/[1 - [15]]	Google Price Per Transaction		Calculated
[17] = [6] - [16]	Total Savings Per Transaction		Calculated
[18]	Pass-Through Rate		Economic principles/econometric estimates. *See* Part IV.C, *infra*.
[19] = [18]*[17]	Consumer Savings Per Transaction		Calculated
[20] = [5] - [19]	Consumer Price Per Transaction		Calculated
[21] = [16]/[20]	Take Rate		Calculated
[22] = [4]*[19]	**Aggregate Damages**		Calculated

472. In the actual world, $E_s = 0$ because competitive rivals are constrained by Google's restrictions. Therefore, $E_M = E_g S_g$. *See, e.g.,* MICHAEL KATZ AND HARVEY ROSEN, MICROECONOMICS 3rd ed. 329-330 (Irwin/McGraw-Hill 1998).

219. The values for the parameters in the competitive but-for world are summarized in the second panel of Table 5 above. Even in the presence of substantial competition, I assume conservatively that Google would have retained a substantial market share of 60 percent in the In-App Aftermarket. As noted above, this was approximately AT&T's market share in the long-distance market after competitive entry.[473] It is also substantially above Alcoa's market share after competitive entry by capacity-constrained rival aluminum manufacturers (approximately 35 percent).[474] This estimate is also conservative in relation to market share and concentration statistics for e-commerce markets, in which the payment method is generally not tied to the rest of the transaction: There exists a range of payment methods accepted in U.S. e-commerce markets, from credit and debit cards (Visa, Mastercard, etc.) to digital wallet services (such as Amazon Payments, PayPal, Square, and others).[475] Credit and debit cards account for approximately 58 percent of e-commerce transactions; the second largest payment method is digital wallets, at 25 percent.[476] Visa, the largest credit and debit platform, has a market share of 60 percent.[477] Visa's share of e-commerce payments can therefore be estimated at approximately [58 percent] x [60 percent] = 35 percent. Within the second largest category (digital wallet services), the largest firm is PayPal, with a market share of approximately 55 percent.[478] PayPal's share of e-commerce payments can therefore be estimated at approximately [55 percent] x [25 percent] = 13.75 percent.[479] Thus, my analysis assumes that, in a more competitive world, Google would command a substantially greater market share than Visa or PayPal in e-commerce.

220. In the instant case, the elasticity of supply of Google's would-be rivals in the market for In-App Aftermarket services cannot be measured directly, because Google has foreclosed entry and expansion by rivals. In Table 5 above, I set E_S = 4.38, based on the supply elasticity for AT&T's long-distance competitors estimated econometrically in the literature.[480] Using equation V.10, Google's competitive own-firm demand elasticity for In-App Aftermarket services can now be calculated at [redacted], which implies a but-for price-cost margin of [redacted] percent, as seen in Table 5 above. This competitive price-cost margin is well within the range of AT&T's price-cost margins

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473. Kahai et al., *supra*, at 510. This reflects AT&T's output-based market share. Its asset-based market share was even lower, at approximately 40 percent. *Id.*

474. Yang, *supra,* at 1417.

475. J.P. Morgan, *E-commerce Payments Trends: United States* (2019), *available at* www.jpmorgan.com/merchant-services/insights/reports/united-states.

476. The remainder was accounted for by bank transfers and other methods. J.P. Morgan, *2020 E-commerce Payments Trends Report: US*, *available at* www.jpmorgan.com/merchant-services/insights/reports/united-states-2020. *See also* D. Tighe, *Distribution of e-commerce payment methods in the United States in 2020*, STATISTA, *available at* www.statista.com/statistics/935676/payment-methods-used-for-online-transactions-usa/ (showing credit cards at 30 percent of e-commerce payments, debit cards at 21 percent, and digital wallets at 30 percent).

477. *See, e.g.,* Lewis Krauskopf, *Swiping their way higher: Visa, Mastercard could be the next $1 trillion companies*, REUTERS (January 31, 2020), *available at* www.reuters.com/article/us-visa-mastercard-stocks/swiping-their-way-higher-visa-mastercard-could-be-the-next-1-trillion-companies-idUSKBN1ZU0JA ("Visa holds a 60% share of the credit and debit card market[.]"). *See also* Julija A., *US Credit Card Market Share: Facts and Statistics,* FORTUNLY (November 23, 2021), *available at* fortunly.com/articles/credit-card-market-share/.

478. *See, e.g.*, Douglas Karr, *PayPal Market Share Statistics And Its History of Dominating Online Payment Processing*, MARTECH ZONE (Aug. 3, 2020), *available at* martech.zone/paypal-statistics-online-payments/.

479. PayPal's overall online market share has been independently estimated at 14 percent. *See* Stephanie Chevalier, *Which form of payment do you use most often for online shopping?*, Statista, *available at* www.statista.com/statistics/448712/online-shopping-payment-method-preference-usa/. *See also* Douglas Karr, *PayPal Market Share Statistics And Its History of Dominating Online Payment Processing*, MARTECH (Aug. 3, 2020), *available at* martech.zone/paypal-statistics-online-payments/ ("18% of all e-commerce is processed by PayPal[.]").

480. Kahai et al. at 508.

after entry by long-distance competitors (between [redacted] percent),[481] and above Alcoa's post-entry price cost margins of 12 percent.[482] Google's price to developers would fall to [redacted] per transaction in such a competitive but-for world, resulting in total savings of [redacted] per transaction relative to the actual world. In Part V.D below, I estimate that developers would pass on approximately 89.9 percent of these savings to consumers; accordingly, aggregate damages to consumers in the In-App Aftermarket come to [redacted] over the time period from 8/16/2016 through 12/31/2020. As seen above, Google's take rate would fall to [redacted] percent in this competitive but-for world, which would still afford Google a significant margin on the transactions in the In-App Aftermarket that it retains (Google's price-cost margin would be [redacted] percent, as shown in Row 15 of Table 5 above).

2. Analysis of Similar Platforms Corroborates My Competitive Take Rate In the In-App Aftermarket

221. It is common practice in digital markets outside of the In-App Aftermarket for entities to contract with outside payment processors. [redacted][484] E-commerce apps that offer material, non-digital goods or services on Android phones outside the Play Store are not subject to Google's restrictions and use services such as Stripe, PayPal, and Square to process payments. These payment processors charge a materially lower commission to developers than Google. Table 6 provides a list of several prominent examples of take rates charged by other payment processors. The take rates shown in Table 6 reflect healthy competition among payment processors and are closer in magnitude to the implied costs associated with payment processing, a key component of the services that Google provides in the In-App Aftermarket.[485]

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481. *Id.* at 510 ("The corresponding values of the Lerner index…are 0.29 and 0.13.").

482. Yang, *supra*, at 1417 ("Alcoa's residual demand elasticity is -8.3382. Then, the corresponding value of the Lerner index is 0.1199…").

483. *Coda Payments partners Riot Games for payments services across Southeast Asia,* THE PAYPERS, May 4, 2020, *available at* thepaypers.com/ecommerce/coda-payments-partners-riot-games-for-payments-services-across-southeast-asia--1242106.

484. [redacted]

485. As explained in the previous section, my analysis incorporates Google's financial information to account for the possibility that Google incurs additional marginal costs, beyond payment processing. Specifically, I conservatively include all direct costs recorded in GOOG-PLAY-000416245 (with the exception of content costs, which are irrelevant). Although many of the benchmark take rates in Table 6 entail a fee layered on top of a percentage of revenue, I do not impose such a fee in the but-for world modeled above.

TABLE 6: PAYMENT PROCESSORS AND THEIR TAKE RATES

	Payment Processor	Example Clients	Take Rate
(1)	PayPal	American Airlines, eBay, Facebook, Spotify	3.49% + $0.49
(2)	Stripe	Lyft, Under Armour, Blue Apron, Pinterest	2.9% + $0.30
(3)	Amazon Pay	Zuora, Shopify, BigCommerce, Magento	2.9% + $0.30
(4)	Braintree*	Uber, StubHub, Dropbox, Yelp	2.49% + $0.49
(5)	Square	Shake Shack, Postmates, Craver	2.6% + $0.10; 2.9% + $0.30†
(6)	Clover	Verizon Business	2.3% + $0.10
(7)	Authorize.net	TRX Cymbals, Prism Kites	2.9% + $0.30
(8)	Vanco	Churches and public schools	2.35% + $0.35; 2.75% + $0.45††
(9)	Fattmerchant	Lens Crafters, Jimmy Johns, Meineke, Maserati	$99 - $199/month + $0.06 - $0.15 per transaction†††
(10)	Adyen	Booking.com, McDonalds, Spotify, Microsoft	3.3% + $0.10; 3.95% + $0.12; 2.0% + $0.12 ††††
(11)	Google Pay**	Burger King, Dunkin Donuts, Target, Doordash	2.9%
(12)	Apple Pay	Best Buy, Taco Bell, Walgreens, Kohl's	3.0%

Notes: Take rates are based on fees for credit card usage. * Owned by PayPal. ** Not to be confused with Google Play Billing. † Square charges 2.6% + $0.10 for in-person swipes and 2.9% + $0.30 for online purchases. †† Vanco offers 2.75% + $0.45 with their "Start" plan ($10 monthly fee) and 2.35% + $0.35 for their "Sustain" plan ($49 monthly fee). ††† For the "Starter" plan, it costs $99 plus transactional fees running from $0.08 to $0.15; for the "Enterprise" plan, it costs $199 plus transactional fees running from $0.06 to $0.12. Fattmerchant claims this comes out to less than 1.5% for businesses that process more than $80K annually. *See* source below. †††† Adyen charges 3.3% + $0.10 for American Express, 3.95% + $0.12 for Discover, and interchange fees plus $0.12 for Mastercard and Visa. Interchange fees are 2% on average within the US. *See* www.adyen.com/blog/interchange-fees-explained.

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(2) Drew Strojny, *Stripe vs PayPal: Who should you choose?*, MEMBERFUL (Jan. 10, 2016), *available at* memberful.com/blog/stripe-vs-paypal/; Amanda Swan ; Frank Kehl, *How Does Stripe Work? Everything You Need*

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(12) Mark Jansen, Christian de Looper, and Paula Beaton, *PayPal vs. Google Pay vs. Venmo vs. Cash App vs. Apple Pay Cash*, DIGITAL TRENDS (July 5, 2021), *available at* www.digitaltrends.com/mobile/paypal-vs-google-wallet-vs-venmo-vs-square-cash/; MacRumors, *Apple Pay, available at* www.macrumors.com/roundup/apple-pay/#:~:text=Some%20of%20Apple's%20partners%20include,Bell%2C%20and%207%2D11.

D. Standard Economic Principles Show That All or Almost All Developers Would Pass Through to Consumers at Least a Portion of Any Savings from a Lower Take Rate

222. Google's take rate from developers typically ranges from 15 to 30 percent of revenue, with the average rate just below 30 percent.[486] In the competitive but-for world, these costs would have been lower. As explained in this section, standard economic models applied to data produced in discovery demonstrate all or almost all Class members would have benefitted as a result. I take no position on whether proof of pass-through is necessary under the law.

1. Standard Economics Shows That Prices Depend on Costs

223. One of the most universal principles of economics is that prices depend on costs.[487] Prices rise as marginal costs rise and fall as marginal costs fall. In perfectly competitive markets,

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486. *See* Table 5, *supra*, Row 3 (showing Google's take rate for the In-App Aftermarket at [redacted] percent). Because the bulk of consumer expenditures in the In-App Aftermarket, Google's aggregate take rate across both markets is close to [redacted]

487. *See, e.g.,* MANKIW, Chapter 4; Chapter 13.

firms pass through to buyers 100 percent of marginal cost increases or decreases in the form of correspondingly higher or lower prices.[488] In the absence of perfect competition, or indeed any competition, elementary economic principles of profit-maximization still dictate that prices will rise and fall with marginal costs.[489] Even if a firm has market or monopoly power, it will still maximize profits by passing costs to buyers; the fraction passed through depends on the shape of the demand curve (e.g., flat or curved). For example, with a linear demand curve (a downward sloping straight line), even in monopolistic markets, at least half of marginal cost savings are passed through to customers.[490] For nonlinear demand curves, the pass-through rate generally exceeds 50 percent.[491] For a demand curve with a constant elasticity, pass-through exceeds 100 percent.[492]

224. In markets served by competing firms with some degree of market power, such as developers on the Play Store or in the In-App Aftermarket, prices fall as marginal costs decline whenever firms choose price to maximize profit. A firm selling a single product (and thus facing downward-sloping demand) maximizes profit by charging a markup of price over cost equal to the inverse of the elasticity of demand.[493] This inverse elasticity rule can be written:

$$(P - C) / P = 1 / E_D,$$

where P is the price of the product, C is its marginal cost, and E_D is the firm's own-price elasticity of demand, defined as the percentage decrease in quantity demanded generated by a one percent increase in price. As seen above, the greater is C, the higher P must be to balance the equation.

225. Google's requirement that developers pay a percentage of their revenue to Google is mathematically equivalent to an increase in developers' marginal cost. To see this, let t be the take rate, where t is greater than zero and less than one, let Q be the quantity sold, and let $C(Q)$ be the developer's cost function.[494] The developer maximizes profit by maximizing the following expression:

$$\text{Profit} = \text{Total Revenue} - \text{Total Cost} = PQ(1 - t) - C(Q)$$

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488. *Id.* at 272, Figure 1 (showing price = marginal revenue = marginal cost for a competitive firm).

489. *See, e.g.,* Jerry Hausman & Greg Leonard, *Efficiencies from the Consumer Viewpoint,* 17(3) GEORGE MASON LAW REVIEW 707, 708 (1999) ("profit maximization by the firm causes it to pass through at least some of the cost savings in terms of a lower price, even if the firm is a monopolist.").

490. *Id.* at 707 ("[S]o long as demand curves have the expected shape, the minimal amount of marginal cost savings passed on by a monopolist in terms of lower price is one-half of the cost savings.").

491. *Id.* at 721-724.

492. Theon van Dijk & Frank Verboven, *Quantification of Damages*, 3 ISSUES IN COMPETITION LAW AND POLICY 2331, 2342 (ABA Section of Antitrust Law 2008) ("When the price elasticity of demand is constant, η=0, and firms find it optimal to keep their percentage price-cost markup constant regardless of the cost conditions. This implies that a cost increase would lead to a higher absolute price cost-margin, which promotes pass-on.").

493. Hausman & Leonard, *supra*, at 713 (equation (5)). *See also* Landes & Posner at 937 (showing the analogous inverse-elasticity markup for a monopolist); Steven Berry, *Estimating Discrete Choice Models of Product Differentiation* 25(2) RAND JOURNAL OF ECONOMICS 242–262 (1994); Gregory Werden & Luke Froeb, *The Antitrust Logit Model For Predicting Unilateral Competitive Effects* 70 ANTITRUST LAW JOURNAL 257 (2002); Aviv Nevo, *Mergers with Differentiated Products: the Case of the Ready-to-Eat Cereal Industry*, 31(3) RAND JOURNAL OF ECONOMICS 395-421 (2000).

494. The cost function gives the developer's total cost as a function of the quantity produced. *See, e.g.,* MANKIW, *supra*, at 248-262.

Taking the derivative of the above equation with respect to Q, and setting the derivative equal to zero, the developer's profit-maximizing price satisfies the following equation:

$$(P - C^*) / P = 1 / E_D,$$

where $C^* = C/(1 - t)$.[495] Thus, when the developer pays a take rate to Google, the inverse-elasticity rule is modified as if the developer faced a higher marginal cost. For example, if the take rate is 30 percent, then $C^* = C/(1 - t) = C/(1 - 0.3)$= [1.43 x C]. Put differently, charging a take rate of 30 percent is economically equivalent to a 43 percent increase in the developer's marginal cost.[496]

226. The competitive but-for world contemplates a long-run equilibrium, in which Google's take rate is substantially and permanently lower. Standard economics shows that a substantial and permanent reduction in developer's costs will cause substantial and permanent downward pricing pressure: Higher long-run costs mean higher prices, and vice-versa. In the long run, a profit-maximizing firm must either charge a price sufficient to cover its average *total* costs—inclusive of fixed costs—or exit the market.[497] To remain in business, a profit-maximizing firm must cover both its explicit costs of doing business and the opportunity costs incurred by not deploying its resources elsewhere.[498] Competition over the long run pushes prices downward towards levels that enable firms to cover their explicit costs and earn a competitive rate of return.[499] If Google's take rate were substantially and permanently lower, developers could cover all their costs and earn a competitive rate of return while charging consumers lower prices than they could otherwise.

2. Class Members Would Have Benefitted from Developers' Substantially Lower Costs through Various Economic Mechanisms

227. Class members would have benefitted from developers' lower costs in several ways. *First*, standard economics shows that Google's take rate influences a developer's initial decision regarding pricing for paid apps (and the pricing of any In-App Content) when the developer first enters the market (or when the developer first introduces new In-App Content). A developer faced with the prospect of paying up to 30 percent of its revenue to Google in perpetuity, all else equal, will need to charge a higher price to consumers than a developer facing a lower take rate. [redacted]

495. Profit maximization requires that the developer set marginal revenue (MR) equal to marginal cost (C). The developer's marginal revenue is $MR = (P + Q(\partial P/\partial Q))(1 - t)$, so profit maximization requires: $(P + Q(\partial P/\partial Q))(1 - t) = C$, which is equivalent to $(P + Q(\partial P/\partial Q)) = C^*$. Solving for the profit-maximizing markup, we obtain $P - P/E_D = C^*$, or $(P - C^*)/P = 1/E_D$.

496. The competitive but-for world contemplates a long-run equilibrium, in which Google's take rate is substantially and permanently lower. Marginal cost should therefore be interpreted as developers' long-run marginal cost, inclusive of the cost of inputs that are variable over the long run.

497. *See, e.g.,* MANKIW, *supra*, at 273-277.

498. *Id*. at 250-251; 279-284.

499. *Id*.

500. *See, e.g., ProtonMail wades into U.S. antitrust war*, AXIOS, July 22, 2021 ("At the top of Proton's list of grievances is the 30% commission Apple collects on subscriptions sold through its App Store, with Google planning to enforce the same fee (although Google recently announced a temporary extension to 2022). Proton's "freemium" model means it relies on paid subscriptions for revenue. The company raised prices for consumers to cover the Apple

[redacted][501] In addition, the price that the developer can charge to consumers will depend on the prices charged by competing developers: All else equal, a developer can charge a higher price when its competitors do the same—and competitors will charge higher prices when the take rate, and thus their costs, are higher.

228. *Second*, as explained above, standard economics shows that prices depend on costs; profit maximization dictates that decreased costs are passed through (at least partially) in the form of lower prices. In the competitive but-for world, developers' costs would have been substantially and permanently lower relative to the actual world. This, in turn, would have resulted in substantially and permanently lower prices paid by consumers.

229. *Third*, developers would face clear economic incentives to engage in steering in a competitive but-for world with more than one distribution channel by sharing a portion of the cost savings from a lower take rate with consumers who download Apps or In-App Content from a lower-cost platform. Prices for paid Apps and In-App Content are set by the developer. If a developer is charged a lower commission by one supplier relative to another, the developer can incentivize consumers to use the lower-cost supplier if the developer adjusts downward prices to consumers through the lower-cost source. This adjustment will steer customers to the favored supplier. In response, Google would be incentivized to lower its commissions from developers to prevent steering away from Google Play Billing (as well as from the Play Store in the Android App Distribution Market).

230. One possible mechanism for steering is illustrated by the Ultimatum Game, described originally by economist and Nobel laureate John Harsanyi in 1961.[502] Consider a setting in which a developer stands to save $1 in "service fees" per transaction if its customer elects to transact on a lower-cost platform than the Play Store for Apps or transacts through a payment processor other than Google Play Billing for In-App Content. To induce the consumer to select the lower-cost alternative, the developer must decide how much of the dollar to share with the consumer in the form of a reduced price for Apps or In-App Content. If the developer is not

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fee, and is facing the prospect of doing the same when Google enforces its fee. "As a small company, there is no way we can afford to just absorb those fees," Miseviciute said. "So we are forced to raise the subscription prices for our consumers."). [redacted]

501. [redacted]

502. John Harsanyi, *On the Rationality Postulates underlying the Theory of Cooperative Games,* 5(2) JOURNAL OF CONFLICT RESOLUTION 179–196 (1961).

sufficiently generous with the amount offered, the consumer will continue to transact with Google, depriving the developer of any savings.

231. Google's documents explicitly contemplate steering as a consequence of lower take rates.[503] The slide below illustrates Google's projection of steering incentives if payment processing were unbundled, summarized by the asterisks in the final column. (It bears emphasis that, in the competitive but-for world, payment processing would be unbundled in tandem with distribution services in the In-App Aftermarket as Google's restrictions were eliminated.)

232. The figure shows that as Google's unbundled take rate (again, excluding payment processing) the greater are developers' steering incentives—that is, developers' incentives to "steer user choice" by lowering the price to consumers that select a lower-cost (non-Google) payment option. When the unbundled take rate is lower, there exists a greater likelihood that a cheaper alternative bundle can be

503. *See e.g.*, GOOG-PLAY-006829073 at GOOG-PLAY-006829085 ( ) (emphasis added).

constructed, with a combined take rate (including payment processing) below 30 percent.[504] The "Consumer Spend w/Choice" column displays Google's estimate of how much revenue could potentially move to competitive billing systems under each option. [redacted]

233. *Fourth*, even if one assumes that some developers would not lower their prices in the competitive but-for world, consumers still would benefit from quality improvements in Apps and In-App Content that developers would be able finance out of monies saved from lower take rates. Standard economics shows that competition drives firms to make competitive investments in product quality to keep pace with rivals.[505]

3. Statistical Analysis Using Standard Economic Models Confirms Widespread Pass-Through in a Competitive But-For World

234. In this section, I apply standard econometric models to data produced in discovery to estimate the extent to which developers would have passed lower costs (that is, lower take rates) to consumers in the form of lower prices in a competitive but-for world without Google's restrictions. My empirical analysis suggests very high pass-through rates among developers (on the order of 89.9 percent).

235. Using standard multiple-regression methods, I have econometrically estimated demand curves encompassing initial App downloads and purchases of In-App Content. In each regression, demand for a given App (or In-App Content) is modeled as a function of the price of that App (or the price of the In-App Content). All of the regressions include fixed effects.[506] Each fixed effect is unique to a given App, and to a purchase type for each transaction. Google's data presents three purchase types (initial downloads, in-app, and subscription). Thus, the regressions control for App-specific characteristics, as well as for differences in the demand for initial downloads of a given App, versus the demand for in-app purchases within that same App.

236. I have estimated nonlinear logit demand systems, which are commonly used in applied antitrust analysis.[507] In a logit demand system, the share for each product *j* is given by the following formula:

$$\ln(S_j / S_0) = \delta_j + \alpha P_j$$

504. If a developer does not use an alternative payment processor, Google's take rate remains at 30 percent. The developer can therefore lower its total take rate if the unbundled take rate (paid to Google) *plus* the cost of a third-party payment processor is below 30 percent. The lower the unbundled take rate, the easier it will be for a developer to construct such a bundle.

505. Department of Justice & Federal Trade Commission, *Horizontal Merger Guidelines* (2010), §10.

506. *See, e.g.,* JEFFREY WOOLDRIDGE, INTRODUCTORY ECONOMETRICS: A MODERN APPROACH, (THOMPSON 4TH ED. 2009), Chapter 14.1 [hereafter WOOLDRIDGE].

507. *See, e.g.,* Gregory Werden & Luke Froeb, *The Antitrust Logit Model For Predicting Unilateral Competitive Effects,* 70 ANTITRUST LAW JOURNAL 257 (2002). *See also* Jonas Bjornerstedt & Frank Verboven, *Merger simulation with nested logit demand*, 14(3) STATA JOURNAL 511-540 (2014).

Above, S_j is the share of product j, and S_0 is the share of the outside good—that is, the proportion of consumers that do not purchase any of the products.[508] The term δ_j represents factors other than price that shift share. These are modeled as fixed effects unique to a given App and purchase type (Initial Downloads, In-App, and Subscription).[509] Google's data presents three purchase types (Initial Downloads, In-App, and Subscription). Thus, the regressions control for differences in the demand for Initial Downloads of a given App, versus the demand for In-App purchases within that same App. In total, the regressions include over 200,000 control variables.

237. In Table 7 below, I econometrically estimate logit demand systems using standard ordinary least squares ("OLS") regressions.[510] In addition, I used standard instrumental-variable ("IV") regressions to correct for endogeneity.[511] In the IV regressions, taxes are used as an exogenous instrument that shifts price independently of other demand drivers.[512] The first two columns in Table 7 below report aggregate regressions that span all of Google's categories, with OLS regressions reported in the first column and IV regressions reported in the second column. Consistent with economic expectations, the regression results confirm a negative and highly statistically significant relationship between demand and price. For example, in Table 7 below, the coefficient on price (P) in Column (1) is -0.0107, and it is highly statistically significant, with a p-value of 0.000. According to Column (1), a one dollar increase in price leads to a 1.07 percent decrease in share.[513] Column (2) shows how the regression output changes after I correct for price endogeneity using IV. According to Column (2), a one dollar increase in price leads to a 5.16 percent decrease in share. This result is also highly statistically significant.

238. In Columns (3) and (4) of Table 7 below, I estimate separate logit demand systems for each of the categories used by Google, using a separate regression model for each category.[514] After correcting for price endogeneity using IV, the results for nearly all categories are consistent with economic expectations, in that the coefficient on price is both negative and statistically significant.[515] As summarized by the R-squared statistics below, the logit demand system regressions explain approximately 86 to 87 percent of the variation in the dependent variable.

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508. [redacted] GOOG-PLAY-000559379 at GOOG-PLAY-000559380 ([redacted]). As explained below, because the pass-through rate in the logit model increases with the share of the outside good, I conservatively set it to zero for purposes of my pass-through calculations.

509. *See, e.g.,* WOOLDRIDGE, Chapter 14.1.

510. WOOLDRIDGE, *supra*, Chapter 3.

511. Instrumental variables techniques are used to identify the demand curve separately from the supply curve. *Id.* Chapter 15.

512. Taxes are used as instrumental variables because they directly affect price but are uncorrelated with other demand shifters. *Id.*

513. This represents a percent change, as opposed to percentage points.

514. In these regressions, the share of the outside good is calculated on a category-specific basis. For example, the share of the outside good for the "Art & Design" category is equal to the share of the market that either (1) made purchases in any of the other categories; or (2) did not purchase at all.

515. The only exception is the "Transportation" category, which accounts for less than 0.01 percent of consumer expenditures.

TABLE 7: ECONOMETRIC DEMAND CURVE ESTIMATES
LOGIT DEMAND: $\ln(S_j / S_0) = \delta_j + \alpha P_j$

		(1) OLS Aggregate	(2) IV Aggregate	(3) OLS By Category	(4) IV By Category
P	*All Categories*	-0.0107***	-0.0516***	N/A	N/A
		(0.000)	(0.000)	N/A	N/A
P	*Art & Design*	N/A	N/A	-0.00834***	-0.0233***
		N/A	N/A	(0.000)	(0.000)
P	*Auto & Vehicles*	N/A	N/A	0.00194**	-0.0141***
		N/A	N/A	(0.0438)	(0.000)
P	*Beauty*	N/A	N/A	-0.0108*	-0.103***
		N/A	N/A	(0.0656)	(0.000)
P	*Books & Ref*	N/A	N/A	-0.0329***	-0.0999***
		N/A	N/A	(0.000)	(0.000)
P	*Business*	N/A	N/A	-0.0116***	-0.0218***
		N/A	N/A	(0.000)	(0.000)
P	*Comics*	N/A	N/A	-0.0144***	-0.0319***
		N/A	N/A	(0.000)	(0.000)
P	*Communication*	N/A	N/A	-0.00745***	-0.0199***
		N/A	N/A	(0.000)	(0.000)
P	*Dating*	N/A	N/A	-0.00597***	-0.0314***
		N/A	N/A	(0.000)	(0.000)
P	*Education*	N/A	N/A	-0.0151***	-0.0395***
		N/A	N/A	(0.000)	(0.000)
P	*Entertainment*	N/A	N/A	-0.0258***	-0.0659***
		N/A	N/A	(0.000)	(0.000)
P	*Events*	N/A	N/A	-0.00595	-0.151***
		N/A	N/A	(0.584)	(0.000)
P	*Finance*	N/A	N/A	-0.0139***	-0.0408***
		N/A	N/A	(0.000)	(0.000)
P	*Food & Drink*	N/A	N/A	-0.00322***	-0.00514***
		N/A	N/A	(0.000)	(0.000)
P	*Game*	N/A	N/A	-0.00126***	-0.0709***
		N/A	N/A	(0.000)	(0.000)
P	*Health & Fitness*	N/A	N/A	-0.0203***	-0.0435***
		N/A	N/A	(0.000)	(0.000)
P	*House & Home*	N/A	N/A	-0.0153***	-0.0238***
		N/A	N/A	(0.000)	(0.000)
P	*Library & Demo*	N/A	N/A	-0.0308***	-0.204***
		N/A	N/A	(0.000)	(0.000)
P	*Lifestyle*	N/A	N/A	-0.0245***	-0.0546***
		N/A	N/A	(0.000)	(0.000)
P	*Maps & Nav*	N/A	N/A	-0.0230***	-0.0726***
		N/A	N/A	(0.000)	(0.000)
P	*Media & Video*	N/A	N/A	-0.0504	-0.138***
		N/A	N/A	(0.143)	(0.001)
P	*Medical*	N/A	N/A	-0.0122***	-0.0462***

		(1) OLS Aggregate	(2) IV Aggregate	(3) OLS By Category	(4) IV By Category
		N/A	N/A	(0.000)	(0.000)
P	*Music & Audio*	N/A	N/A	-0.0431***	-0.142***
		N/A	N/A	(0.000)	(0.000)
P	*News & Mag*	N/A	N/A	-0.00716***	-0.0202***
		N/A	N/A	(0.000)	(0.000)
P	*Parenting*	N/A	N/A	-0.0395***	-0.114***
		N/A	N/A	(0.000)	(0.000)
P	*Personalization*	N/A	N/A	-0.0770***	-0.277***
		N/A	N/A	(0.000)	(0.000)
P	*Photography*	N/A	N/A	-0.0397***	-0.0762***
		N/A	N/A	(0.000)	(0.000)
P	*Productivity*	N/A	N/A	-0.0216***	-0.0596***
		N/A	N/A	(0.000)	(0.000)
P	*Shopping*	N/A	N/A	-0.0116***	-0.0389***
		N/A	N/A	(0.007)	(0.000)
P	*Social*	N/A	N/A	-0.0175***	-0.0569***
		N/A	N/A	(0.000)	(0.000)
P	*Sports*	N/A	N/A	-0.00938***	-0.0336***
		N/A	N/A	(0.000)	(0.000)
P	*Tools*	N/A	N/A	-0.0276***	-0.0777***
		N/A	N/A	(0.000)	(0.000)
P	*Transportation*	N/A	N/A	0.0714***	0.820***
		N/A	N/A	(0.009)	(0.000)
P	*Travel & Local*	N/A	N/A	-0.0149***	-0.0487***
		N/A	N/A	(0.000)	(0.000)
P	*Video Players*	N/A	N/A	-0.0274***	-0.0496***
		N/A	N/A	(0.000)	(0.000)
P	*Weather*	N/A	N/A	-0.0397***	-0.142***
		N/A	N/A	(0.000)	(0.000)
	Constant	-18.65***	-18.39***	N/A	N/A
		(0.000)	(0.000)	N/A	N/A
	Includes FE?	Y	Y	Y	Y
	Number of FE	212,925	212,925	212,925	212,925
	Observations	1,905,224	1,905,224	1,905,224	1,905,224
	R-Squared	87.3%	87.5%	85.9%	86.2%

p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Columns (3) and (4) reflect the output of 35 separate regressions. For these columns, the "Number of FE" and "Observations" are the total number of Fixed Effects and Observations used in all of the regressions. The *R*-squared statistics in columns (3) and (4) are average *R*-squared values across all regressions, weighted by number of observations.

239. In Table 8 below I calculate pass-through rates, which are the ratio of the dollar change in a developer's profit-maximizing price resulting from a one-dollar change in marginal cost. The logit demand system yields a pass-through rate equal to $[M - Q_j]/M$, where M is the size

of the market—inclusive of the outside good—and Q_j is the quantity sold of a given product.[516] All else equal, the larger is the share of the outside good (S_0), the larger is M, and the larger is the pass-through rate. Because the pass-through rate increases with the share of the outside good, I conservatively set S_0 equal to zero for purposes of calculating pass-through using the logit demand system.[517] As seen in the first row of Table 8 below, the logit demand system yields an overall pass-through rate of 89.9 percent. This estimate is calculated as the weighted average across all categories in the final column, with each category receiving a weight proportional to the quantity of transactions in that category. (Thus, the "Game" category receives more weight than others).

240. In summary, I estimate that developers' profit-maximizing response to a one dollar decrease in costs would be to decrease their prices to consumers by approximately $0.90. This price decrease is profit-maximizing because the marginal benefit to developers of lowering the price in the competitive but-for world—increasing the demand for Apps or In-App Content—exceeds the marginal cost of meeting the increased demand. If developers were to reduce their prices by less, their profit in the competitive world would be lower.

516. *See, e.g.,* Nathan Miller, Marc Remer, & Gloria Sheu, *Using cost pass-through to calibrate demand*, 118 ECONOMICS LETTERS 451-454, 452-453 (2013) (Equation 6 provides the formula for inverse of the pass-through rate, multiplied by negative one, which is: $-M/[M - Q_j]$, where M is the market size and Q_j is the quantity of product j. The pass-through rate is obtained by multiplying the expression by negative one and inverting it, which yields $[M - Q_j]/M$).

517. In addition, I conservatively aggregate purchase quantities by developer.

TABLE 8: PASS-THROUGH RATES

Category	Pass-Through Rate
ALL	**89.9%**
ART_AND_DESIGN	[redacted]
AUTO_AND_VEHICLES	
BEAUTY	
BOOKS_AND_REFERENCE	
BUSINESS	
COMICS	
COMMUNICATION	
DATING	
EDUCATION	
ENTERTAINMENT	
EVENTS	
FINANCE	
FOOD_AND_DRINK	
GAME	
HEALTH_AND_FITNESS	
HOUSE_AND_HOME	
LIBRARIES_AND_DEMO	
LIFESTYLE	
MAPS_AND_NAVIGATION	
MEDIA_AND_VIDEO	
MEDICAL	
MUSIC_AND_AUDIO	
NEWS_AND_MAGAZINES	
PARENTING	
PERSONALIZATION	
PHOTOGRAPHY	
PRODUCTIVITY	
SHOPPING	
SOCIAL	
SPORTS	
TOOLS	
TRANSPORTATION	
TRAVEL_AND_LOCAL	
VIDEO_PLAYERS	
WEATHER	

4. Analysis of Pass-Through in Alternative Settings Corroborates Developer Pass-Through

241. In this section, I provide evidence and examples of pass-through that support my econometric calculation of the pass-through rate.

a. Apps That Avoid In-App Aftermarket Restrictions

242. Historically, some developers using the Play Store, including Netflix, Spotify, and Tinder, have refused to compel their customers to use Google Play Billing for In-App Content by instead redirecting them to a web browser.[518] Some developers allow consumers to transact both within the Google Play Store and Google Play Billing as well as outside of them at a lower price, permitting an apples-to-apples comparison that provides evidence of pass-through. Bookedin, an appointment scheduling software App, points out that it "need[ed] to charge extra to compensate for additional fees Apple and Google charge Bookedin to sell our app in their store."[519] The price offered on the Bookedin website for its "Pro 1" membership is $24/month vs. $34.99/month for the App sold through the Play Store, offering a 31 percent discount for avoiding Google's 30 percent take rate.[520] Down Dog, a yoga and exercise app, charges $7.99 a month on its website vs. $9.99 for the App purchased through the Google Play Store, implying a discount of 20 percent.[521] Tinder, a popular dating App and the second-highest grossing App on the Google Play Store, has discounted the subscription prices on its website by ten percent, relative to the price of the same subscriptions when purchased within the Play Store.[522] As observed by Jared Sine, Chief Legal Officer of Match Group (the parent company of Tinder), Google's and Apple's commissions amounted to "$500 million dollars that could be going back into the pockets of everyday consumers or deployed to hire employees or invest in new innovations."[523]

243. Spotify, a popular music-streaming App, reluctantly allowed consumers to purchase its subscription music service from within Apple's App Store (where it did not negotiate a lower take rate). Spotify was forced to raise the cost of its premium subscription service within

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518. Ron Amadeo, *Google announces crackdown on in-app billing, aimed at Netflix and Spotify*, ARS TECHNICA (Sept. 20, 2020) ("Today, Netflix and Spotify don't use Google's in-app billing and instead kick new accounts out to a Web browser, where the companies can use PayPal or direct credit card processing to dodge Google's 30-percent fees"); *see also* Kif Leswing, *Google to enforce 30% take from in-app purchases next year*, CNBC (Sept. 28, 2020), *available at* www.cnbc.com/2020/09/28/google-to-enforce-30percent-cut-on-in-app-purchases-next-year.html; Nick Statt, *Tinder is now bypassing the Play Store on Android to avoid Google's 30 percent cut*, THE VERGE (Jul. 19, 2019), *available at* www.theverge.com/2019/7/19/20701256/tinder-google-play-store-android-bypass-30-percent-cut-avoid-self-install.

519. Bookedin, *Why are the prices different in App Store/Google Play?* (accessed June 15, 2021), *available at* support.bookedin.com/hc/en-us/articles/360028446492-Why-are-the-prices-different-in-App-Store-Google-Play-

520. ($34.99 - $24.00) / ($34.99) ≈ 31 percent.

521. ($9.99 - $7.99) / ($9.99) = ≈ 20 percent.

522. Based on prices observed on Tinder website vs. through Google Play on an Android device. Tinder Plus costs $9.99/month on Play compared to $8.99/month on its website, implying a discount of ($9.99 - $8.99) / ($9.99) ≈ 10%. Tinder Gold costs $14.99/month on Play compared to $13.49/month on its website, implying a discount of ($14.99 - $13.49) / ($14.99) ≈ 10%. Tinder Platinum costs $19.99/month on Play compared to $17.99/month on its website, implying a discount of ($19.99 - $17.99) / ($19.99) ≈ 10%.

523. Testimony for the S. Judiciary Committee, Subcomm. on Competition Policy, Antitrust, and Consumer Rights, at 2 (Jared Sine, Chief Legal Officer, Match Group, Apr. 21, 2021) [hereafter Sine Testimony].

the App Store from $9.99 per month to $12.99 per month in 2014.[524] This $3 increase can be understood as Spotify's attempt to roughly equalize its margins between its service through the internet ($9.99) and through the Apple App Store ($12.99).[525] Per Horacio Gutiérrez, Head of Global Affairs and Chief Legal Officer for Spotify: "Spotify could not absorb the IAP [in-app product] tax without raising its prices, because a large component of its costs are the licensing fees paid to record labels and music publishers."[526] Gutiérrez pointed out that "[o]ne doesn't need a Ph.D. in economics to recognize that Apple is hurting consumers by forcing competitors either to charge higher prices or preventing competitors from communicating offers of discounts or other promotional offers."[527] A European Commission investigation into prices charged by music-streaming providers showed that Apple's 30 percent commission rate was typically passed through in full to consumers.[528] [redacted].[529] Finally, YouTube's subscription service charges a higher price on the Apple App Store "due to Apple's 30% transaction fee[.]"[530] Table 9 summarizes the discussion on implied pass-through rates for major app developers.

524. Testimony for the S. Judiciary Committee, Subcomm. on Competition Policy, Antitrust, and Consumer Rights, at 8 (Horacio Gutierrez, Head of Global Affairs and Chief Legal Officer, Spotify, Apr. 21, 2021).

525. Celena Chong, *Spotify shows its iPhone users how to save $3 by avoiding Apple's App Store*, BUSINESS INSIDER (July 8, 2015), *available at* www.businessinsider.com/spotify-shows-users-how-to-save-3-by-avoiding-apple-app-store-2015-7 ("Both Spotify and Apple Music technically charge $9.99 a month, but subscriptions purchased through the iTunes App Store charges a 30 percent fee — causing Spotify to charge $12.99 for its premium service within iTunes to generate the same revenue."). Apple's 30 percent commission would be $3.90 on a price of $12.99. By raising its price by only $3, Spotify was passing through 77 percent ($3/$3.90) of the increase due to the imposition of Apple's take rate.

526. Testimony for the S. Judiciary Committee, Subcomm. on Competition Policy, Antitrust, and Consumer Rights, at n. 13 (Horacio Gutierrez, Head of Global Affairs and Chief Legal Officer, Spotify, Apr. 21, 2021).

527. *Id.* at 9.

528. Statement by Executive Vice-President Margrethe Vestager on the Statement of Objections sent to Apple on App Store rules for music streaming providers (Apr. 30, 2021) ("Our investigation showed that this fee was passed on to end users by raising prices, typically from 9.99 to 12.99 Euros.").

529. [redacted]

530. Feng Dep. at 292:4-293:9, referencing PX 518 [redacted]

TABLE 9: PRICE COMPARISON OF APPS THROUGH WEBSITE VS. APP STORE

	App	Product	Website Price	App Store Price	Implied Pass-Through Rate*
1	Tinder	Gold Membership	$13.49/month	$14.99/month (Google Play)	33%
2	BookedIn	Professional	$24/month	$34.99/month (Google Play)	105%
3	Down Dog	Unlimited Access to All Down Dog Apps	$7.99/month	$9.99/month (Google Play)	67%
4	Spotify	Premium Subscription Service	$9.99/month	$12.99/month (Apple App Store)	77%
5	Tidal	Premium Subscription Service	$9.99/month	$12.99/month (Apple App Store)	77%
6	YouTube	Subscription Service	$9.99/month	$12.99/month (Apple App Store)	77%

*Pass-through rate = (app price - website price) / ($ app commission - $ website commission) using an assumed zero percent commission charged on the website. Assuming a zero percent commission on the website is conservative so this estimate reflects a lower bound. The calculations conservatively assume a 30 percent take rate paid by the developer to Google (or Apple). To the extent that a developer pays a lower take rate, that developer's pass-through rate would be understated.

Sources: (1 - Tinder) Publicly advertised price; (2 - BookedIn) Appointment Booking & Online Scheduling Software - Pricing – BookedIn, *available at* support.bookedin.com/hc/en-us/articles/360028446492-Why-are-the-prices-different-in-App-Store-Google-Play (3 - Down Dog) Publicly advertised price; (4 - Spotify) Testimony for the U.S. Senate Judiciary Committee, Subcommittee on Competition Policy, Antitrust, and Consumer Rights, Horacio Gutierrez, Head of Global Affairs and Chief Legal Officer, Spotify, April 21, 2021 at 8; (5-Tidal) Shahar Ziv, *Here's Why Your Apple App Store Purchases May Be A Ripoff*, FORBES, (July 8, 2020), *available at* www.forbes.com/sites/shaharziv/2020/07/08/heres-why-your-apple-app-store-purchases-may-be-a-ripoff/?sh=77c6e9872007 ; (6-YouTube) Feng Dep. 292:4-293:9, referencing PX 518.

b. Pass-Through of Sales Taxes and Digital Service Taxes

244. Google's take rate is economically analogous to a tax on developers. Elementary economics shows how taxes are passed on to buyers: Regardless of whether the tax is imposed directly on buyers or instead on sellers, as a matter of theory, buyers end up paying the same portion of the tax.[531] The imposition of state and local sales taxes on digital goods therefore provides a useful example for understanding pass-through in this case. Apps often serve customers across a number of different local tax jurisdictions. When a digital product is subject to a tax, this burden is typically passed through in full to the customer; it is not absorbed by the seller. Indeed,

531. *See, e.g.,* MANKIW, *supra*, at 120-127.

software APIs have been created to facilitate passing through the correct amount of tax based on the local jurisdiction and the product being sold.[532] Economically speaking, this arrangement is tantamount to a commission being imposed on a developer that is fully passed through to the consumer. As summarized by Spotify on its website:

> Some state and local governments may also require us to collect tax (e.g. Sales Tax) if Spotify undergoes marketing/promotional activities in the state or locality, or uses local sales agents or consultants. This fee is included at the point of the transaction, which is why you might see a slightly different price on your receipt to the rate that's advertised.[533]

Examples like this abound: Netflix,[534] Hulu,[535] Amazon,[536] and Google[537] all offer similar disclaimers on their websites regarding local sales taxes. As one press report summarizes, "If you live in one of the nearly 25 states that charge sales tax on digital goods or services you likely pay more for everything from downloaded music, e-books and ringtones to streaming TV shows and video."[538]

E. Google Could Also Respond to Greater Competition By Increasing Its Play Points Program For Consumers

245. The two-sided model for the Android App Distribution Market and the one-sided model for the In-App Aftermarket were used to determine competitive but-for take rates under the assumption that the locus of competition, absent the Challenged Conduct, would be on take rates. For example, the two-sided platform model assumes that Google's access charge to consumers was near zero (and actually negative) in both the actual and competitive but-for worlds. An alternative, plausible response to the elimination of Google's restrictions would be for Google to

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532. *See, e.g.*, Jennifer Dunn, *Sales Tax by State: Should You Charge Sales Tax on Digital Products?* (Feb. 13, 2018), *available at* www.taxjar.com/blog/sales-tax-digital-products ("The TaxJar API allows you to assign a product tax code to the products you sell. If you assign the product tax code for digital goods to the digital products you sell, the TaxJar API automatically charges your customer in any state the right amount of sales tax depending on that state's applicable laws.").

533. Spotify, *Does the price for Premium include tax?, available at* support.spotify.com/us/article/sales-tax/.

534. Netflix, *Taxes on your Netflix membership, available at* help.netflix.com/en/node/50068#:~:text=The%20Netflix%20advertised%20price%20does,membership%20includes%20streaming%20and%20games ("The Netflix advertised price does not include sales tax. If sales tax applies, it is stated separately on your monthly invoice").

535. Hulu, *Why was I charged tax?, available at* help.hulu.com/s/article/charged-sales-tax#:~:text=Why%20was%20I%20charged%20tax%3F&text=In%20certain%20jurisdictions%2C%20Hulu%20is,that%20is%20assessing%20the%20tax ("In certain jurisdictions, Hulu is required to charge tax on our services in order to comply with your state and local laws. This is based on your billing address. When applicable, these taxes are collected by Hulu and are then remitted to the jurisdiction that is assessing the tax.").

536. Amazon, *Help & Customer Service – Tax on Amazon Prime*, *available at* www.amazon.com/gp/help/customer/display.html?nodeId=202036230 ("If you choose to continue, you'll automatically be charged for Amazon Prime plus any applicable taxes").

537. Google, *Tax rates and value-added tax (VAT) - Play Console Help, available at* support.google.com/googleplay/android-developer/answer/138000?hl=en ("In accordance with sales tax requirements, Google is responsible for determining, charging, and remitting sales tax for Google Play Store app and in-app purchases by customers in these states. Google will collect and remit sales tax to the appropriate tax authority, as applicable. You don't need to calculate and send sales tax separately for customers in these states. Even if you're not located in the United States, this treatment will still apply.").

538. Melanie Hicken, *Are you paying the iTunes tax?*, CNN MONEY (June 5, 2013), *available at* money.cnn.com/2013/06/05/pf/taxes/itunes-tax/.

increase its loyalty points program for consumers to encourage their use of the Play Store and Google Play Billing rather than using any other competing source of Apps or In-App Content. An increase in Google's loyalty points would have the effect of reducing prices for purchases of Apps and In-App Content, without any requirement that developers steer consumers via discounting. Indeed, this form of competition is how credit cards compete to retain customers (funded via interchange fees to merchants), and how global distribution systems compete to retain travel agents (funded by booking fees charged to airlines). In addition to serving as a means to compete for consumers, a subsidy to consumers by Google can also bring value to developers by encouraging consumer spending.[539]

246. Given the current lack of competition due to the Challenged Conduct, the size and scope of Google's Play Points program is fairly modest. Android users who signed up pre-2019 must opt in to Google Play Points.[540] In addition, not all Apps participated in Google Play Points.[541] According to one analyst, under the current configuration of the program, "the spend-to-earn ratio is so steep that you would have to spend a pretty unre [redacted][545]

247. [redacted] Google first introduced Play Points in Japan, when it faced competition from Amazon.[546] [redacted][547] It further noted that [redacted]

539. GOOG-PLAY-002653782.R at GOOG-PLAY-002653792.R ([redacted]).

540. Jonathan Jaehnig, *What Are Google Play Points and How Can You Use Them?*, MAKE USE OF, (Apr. 8, 2021), *available at* www.makeuseof.com/what-are-google-play-points/.

541. *Id*.

542. *Id*.

543. GOOG-PLAY-000518034.

544. *Id.*

545. *Id.*

546. Google introduced its Play Points program in Japan in September 2018. *See* C. Scott Brown, *Google Play Points rewards program is real and in Japan right now,* ANDROID AUTHORITY (Sept. 18. 2018), *available at* www.androidauthority.com/google-play-points-rewards-905387/.

547. GOOG-PLAY-001284083.R at GOOG-PLAY-001284086.R. A "churn rate" tells how many customers a company loses over a time period in percentage terms. The risk that a company will lose customers can be referred to as "churn risk." *See* Patrick Icasas, *Your Customer is a Churn Risk (And Here's How We Know),* Catalyst (July 12, 2021), *available at* catalyst.io/blog/your-customer-is-a-churn-risk-and-heres-how-we-know.

[redacted][548]

248. Google next deployed the Play Points program in response to the ONE Store's entry in Korea. The ONE Store offered "cashback events," which amount to 30 to 50 percent of total transactions inside certain gaming Apps,[549] making points (rather than the take rate) the locus of competition. Google planned to combat ONE Store's "lowering rev share to court developers" through Play Points.[550] [redacted] restrictions with incentives and discounts to consumers.

249. [redacted][557] Put differently, to avoid competition by another app store, such as proposed by [redacted], Google cared so much about not having consumers leave the Play Store that Google was willing to [redacted]

250. [redacted] This suggests that Google would be willing to cede as much to consumers to fend off competition in a but-for world without Google's anticompetitive restrictions.

251. To model the effect of an increased subsidy to consumers through Play Points in a competitive but-for world, I once again use the Rochet-Tirole two-sided platform model. However,

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548. GOOG-PLAY-001284083.R at GOOG-PLAY-001284086.R. [redacted] GOOG-PLAY-000879195R.

549. *See* Kim Jung-Min & Chea Sarah, *One Store Gains Ground in Local Android App Market*, KOREA JOONANG DAILY (Dec. 2, 2020), *available at* koreajoongangdaily.joins.com/2020/12/02/business/industry/One-Store-app-market-Google/20201202175300439.html.

550. GOOG-PLAY-000953420.R at GOOG-PLAY-000953422.R.

551. *Id*. at GOOG-PLAY-000953437.R.

552. GOOG-PLAY-000302766 at GOOG-PLAY-000302864 ([redacted]).

553. GOOG-PLAY-000518034 at GOOG-PLAY-000518045.

554. GOOG-PLAY-002653782.R at GOOG-PLAY-002653793.R. *See also* GOOG-PLAY-005708308.

555. GOOG-PLAY-007329029.

556. *Id.*

557. *Id.* at GOOG-PLAY-007329030.

I now solve for a negative transaction price or subsidy to consumers in response to platform competition, assuming that the but-for take rate remains fixed at its observed average value of [redacted] Under the current program, Google's Play Points can be applied to both initial App downloads and purchases of In-App Content—that is, Google does not have two different point programs.[558] It is reasonable to assume the structure of the program would remain the same in a competitive world, albeit with a larger subsidy for consumers, as Google would want to incentivize users to continue purchasing through its platform. Accordingly, I estimate the model only once to obtain a single subsidy in both markets as Google offers now. In contrast, above I estimated the competitive but-for take rate in the Android App Distribution Market separately from the competitive but-for take rate in the In-App Aftermarket, as nothing requires Google to charge the same take rate in those separate markets. My use of the Rochet-Tirole model to estimate a competitive but-for subsidy that can be spent on initial paid App downloads or In-App Content should not be taken to mean that the In-App Aftermarket is a two-sided antitrust market nor that the two separate antitrust markets are suddenly unified. Put differently, that I use the two-sided model to estimate a *single* consumer subsidy across both initial paid App downloads and purchases of In-App Content—a subsidy model that Google uses today and might use in a competitive but-for world—has no bearing on whether the In-App Aftermarket is one-sided or two-sided.

252. Holding the take rate fixed at the observed monopoly level, a monopoly platform operator would maximize its profits by setting the buyer-side platform price P_B such that the following equation is satisfied:

(V.11) $$\frac{P_B + tS - C}{S + P_B} = \frac{1}{\varepsilon_B}$$

where ε_B is the price elasticity of demand from buyers for paid App downloads or In-App Content.[559] In the presence of competition, the platform operator would maximize profits with respect to its residual demand curve (market demand net of demand that is competed away by rivals), yielding the competitive analogous expression:

(V.12) $$\frac{P_B + tS - C}{S + P_B} = \frac{1}{\varepsilon_{OB}}$$

where ε_{OB} is the own-brand price elasticity of demand from buyers for paid App downloads or In-App Content. [560]

253. My sources and methods for obtaining the monopoly scenario inputs shown in Equation (V.11) are:

- P_B^M is equal to the price "charged" by Google to consumers for each transaction made on its platform in the monopoly scenario. Through its Play Point loyalty program and other promotions, Google effectively charges a small negative price to consumers. I compute the average value of this subsidy as the sum of all promotions paid by Google for transactions made in both the Android App Distribution Market and In-App Aftermarket, divided by

558. For this reason, the model can be applied whether there is one market, or whether there is a separate aftermarket.

559. Details of how Equation (V.11) is derived are provided in Appendix 3.

560. Details of how Equation (V.12) is derived are provided in Appendix 3.

the total quantity of paid Apps downloaded in the Android App Distribution Market and purchases of In-App Content in the In-App Aftermarket, as observed in Google's transaction records.

- t is equal to the observed take rate, computed as the sum of all revenue retained by Google in both the Android App Distribution Market and In-App Aftermarket divided by the sum of total revenue spent by consumers in both the Android App Distribution Market and In-App Aftermarket (prior to Google's promotional expenditures, which are captured by P_B^M).

- S is equal to the average price charged for paid Apps in the Android App Distribution Market and In-App Content in the In-App Aftermarket in the monopoly setting.[561] I calculate S as the total amount of revenue spent by consumers (prior to receiving promotions from Google) in both the Android App Distribution Market and In-App Aftermarket divided by the total quantity of paid Apps downloaded in the Android App Distribution Market and purchases of In-App Content in the In-App Aftermarket, as observed in Google's transaction records.

- Marginal cost C represents the incremental cost incurred by Google of executing a transaction in the Android App Distribution Market or In-App Aftermarket. I refer to Google's financial data to infer this value, which suggests that transaction fees, customer support, and other fees are equal to [redacted] percent of consumer expenditures.[562]

- ε_B^M is the buyer-side price elasticity of demand for paid Apps in the Android App Distribution Market and In-App Content in the In-App Aftermarket. ε_B^M reflects the change in the quantity demanded by consumers for Android App Distribution Market or In-App Aftermarket transactions associated with a change in the price of the App or in-App product $S^M + P_B^M$ (inclusive of the buyer-side platform price).[563] Given the other inputs to the monopoly model, the value of ε_B^M is implied by Equation (V.11).

I hold C fixed across the monopoly and competitive scenarios. Because I am modeling competition on the buyer-side consumer price, I hold the developer-side take rate t fixed between scenarios also. Holding t fixed implies no change in the (pre-subsidy) product price S between scenarios. My sources and methods for obtaining the remaining inputs to the competitive scenario expression shown in Equation (V.12) are:

- P_B^C is the competitive buyer-side price charged by Google for each transaction on its platform. Using the other inputs to the model, Equation (V.12) allows me to solve for P_B^C.

- ε_{OB}^C is the "own-brand" price elasticity of demand for paid Apps in the Android App Distribution Market and In-App Content in the In-App Aftermarket by consumers in the presence of competition. ε_{OB}^C reflects the change in the quantity demanded from consumers

561. Apps that are free to download and free In-App content have a zero price and are therefore excluded from the analysis.

562. *See* GOOG-PLAY-000416245 ([redacted]).

563. ε_B^M (which reflects consumer sensitivity to the total product price including buyer-side platform price, $P_B^M + S^M$) differs from, but is related to, the take rate buyer elasticity $\varepsilon_{B,t}^M$ (which reflects consumer sensitivity to the take rate, effectuated via pass-through) that is referred to in Section V.A.3. Further description of these parameters can be found in Appendix 3.

for Android App Distribution Market and In-App Aftermarket transactions—from Google in particular, hence, "own-brand"—associated with a change in App prices. Relative to its monopolistic analogue, this parameter reflects a scenario where Google faces competition from rival platforms; as such, the parameter will be greater in magnitude, because the presence of platform competition allows easier defection from consumers in the presence of a product price increase. I draw from the economics literature empirical evidence of industries that have shifted from monopoly to competition. I conservatively estimate that the buyer-side price elasticity of demand faced by Google shifts from a value of [redacted] (in the monopoly setting, as calculated using Equation (V.11)) to [redacted] in the competitive setting. I arrive at [redacted] using the relation between own-brand elasticity and market demand elasticity under the conservative assumption that Google maintains a [redacted] percent share of the Android App Distribution Market with an inelastic supply response from Google's rivals.[564] Further description of this input is included in Appendix 3.

Table 10 summarizes the inputs and resulting buyer-side platform price. Table 10 shows calculations made with respect to transactions in both the Android App Distribution Market and the In-App Aftermarket combined; the inputs will therefore vary from those used in Table 3. According to this model, the Play Points program would be expanded to be worth an average of [redacted] per transaction, or approximately [redacted] percent of consumer spend (in the competitive but-for world).[565] Because the expanded Play Points program is a direct subsidy to consumers, there is no need to estimate a pass-through model to establish antitrust impact.

564. Similar to Part V.C, *infra*, I use the relation $E_g = \frac{E_M}{S_g} + \frac{E_S(1-S_g)}{S_g}$ where E_g is Google's own-brand elasticity (reflecting price responses of both buyers and sellers), E_M is market elasticity, S_g is Google's market share, and E_S is the elasticity of supply of Google's rivals. I conservatively assume Google maintains a 60 percent market share and that $E_S = 0$. This implies that buyer price elasticity of demand changes from 5.30 in the monopoly setting (estimated using Equation V.12) to 8.83 = 5.30/0.6. *See, e.g.,* Landes & Posner.

565. Equal to the but-for buyer-side platform price of [redacted] divided by the product price of [redacted].

TABLE 10: BUT-FOR BUYER-SIDE PLATFORM COMPETITION MODEL, COMBINED ANDROID APP DISTRIBUTION AND IN-APP AFTERMARKET IMPACT AND DAMAGES (8/16/2016 – 12/31/2020)

Actual World (Monopoly, Eqn. (V.11))

#	Input	Description	Value	Source/Notes
[1]		Consumer Expenditure (US)	[redacted]	GOOG-PLAY-005535886 (US Consumers)
[2]		Google Revenue (US)		GOOG-PLAY-005535886 (US Consumers)
[3]		Google Promotional Expenditures (US)		GOOG-PLAY-005535886 (US Consumers)
[4]		Android App Distribution (Paid) and In-App Transactions		GOOG-PLAY-005535886 (US Consumers)
[5]=[1]/[4]	S	App Product Price		Calculated
[6]=[2]/[1]	t	Take Rate		Calculated
[7]=-[3]/[4]	P_B^M	Buyer-side Platform Price		Calculated
[8]=[5]+[7]	$S + P^M{}_B$	App Product Price Net of Promotions		Calculated
[9]	C	Marginal Cost		GOOG-PLAY-000416245
[10]	ε_B^M	Buyer Price Elasticity of Demand		Calculated (Eqn. (V.11))

But-For World (Competitive, Eqn. (V.12))

	Input	Description	Value	Source
[11]=[5]	S	App Product Price	[redacted]	Calculated (Eqn. (V.8))
[12]=[6]	t	Take Rate		GOOG-PLAY-005535886
[13]	P_B^C	Buyer-side Platform Price		Calculated (Eqn. (V.12))
[14]=[11]+[13]	$S + P^C{}_B$	App Product Price Net of Promotions		Calculated
[15]=[9]	C	Marginal Cost		GOOG-PLAY-000416245
[16]	ε_{OB}^C	Buyer Own-Price Elasticity of Demand		Economic theory/empirical studies
[17]=[8]-[14]		Consumer Savings Per Transaction		Calculated
[18]=[17]*[4]		**Aggregate Damages**		Calculated

254. For the purpose of comparing this result (which pertains to a two-sided market model of competition that occurs with respect to the buyer-side platform price) with results shown in Section V.B (which pertains to a two-sided market model of competition that occurs with respect to the take rate), it is useful to define a "net" take rate as the portion of consumer expenditures that Google retains, net of the amount given to consumers in the form of a subsidy. Google's but-for net take rate when platforms compete on subsidies in the combined Android App Distribution Market and In-App Aftermarket (equal to the [redacted] percent take rate less the [redacted] percentage point subsidy to consumers, effectively [redacted] percent) is slightly lower than Google's net take rate when platforms compete on take rates in the Android App Distribution Market (equal to [redacted] percent,

net of Play Points[566]). It bears noting that the dimension upon which to compete (take rate versus Play Points) is not solely Google's choice. If a rival app store were to compete by (say) offering app developers a 15 percent take rate, then Google could be forced to lower its take rate, in addition to enhancing its Play Points.[567] Because the precise means by which competition would unfold is hard to predict, I have elected to model both extremes here, and demonstrated that consumers would benefit under either and thus have been harmed by the Challenged Conduct.

255. As Table 10 shows, the resulting but-for average price of paid App downloads in the Android App Distribution Market and In-App Aftermarket is [redacted], down from the observed price of [redacted] (net of Google's promotional expenditures to consumers). This difference results in an average overcharge to consumers of $0.76 = $8.904 - $8.146, and aggregate damages of [redacted] (equal to [redacted] transactions) as a result of Google's restrictions, across the Class Period (August 16, 2016, through December 31, 2020).

256. In the actual world, Google awards Play Points to members of the program in proportion to their purchases made in the Play Store; any customer can enroll in Play Points free of charge. In the but-for world, awarding Play Points in proportion to all purchases made by Class members implies lower prices in the but-for world relative to the actual world, and therefore common impact on all or virtually all Class members.

F. A Rigid Pricing Structure Ensures That All Class Members Would Benefit From The Removal Of The Challenged Conduct

257. Google's commission structure affects all paid Apps and purchases of In-App Content by taking a fixed percentage. Moreover, while developers set different prices for their Apps and In-App Content, these differences do not vary by customer. Eliminating the Challenged Conduct would introduce competition driving the commission rate lower or resulting in further subsidies to consumers by enhancing loyalty programs. Enhanced loyalty programs again would not lead to differential prices across different consumers. Both lower commission rates and enhanced loyalty programs would therefore benefit all Class members.

258. This is true even when a Class member purchases from a developer that has received a discount off Google's standard take rate in the actual world. In the actual world, Google has imposed a headline take rate of 30 percent nearly universally, with the following exceptions: (1) a 15 percent take rate rolled out in 2018 for subscription apps (initially only for subscribers after their first year; more recently for all subscribers); (2) a 15 percent take rate charged for the first $1 million of sales (starting July 2021); and (3) instances where developers were able to negotiate a lower take rate. Nevertheless, Google's overall take rate has been at or very close to 30 percent for the vast majority of consumer expenditures: Google's own data show that Google has collected commissions in [redacted] of consumer expenditures in both the Android

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566. Drawing from the results shown in Table 3, the net take rate is equal to the but-for take rate ([redacted]) minus the portion of consumer expenditures that are returned through Google's buyer-side platform price, ($-\frac{P_B}{SC} =$ [redacted]).

567. In the competitive but-for world, rival app stores could compete on many dimensions, including lower take rates, a higher consumer point system, or exclusives with developers. *See, e.g.*, GOOG-PLAY-007329076 at GOOG-PLAY-007329084 ([redacted]).

App Distribution Market and the In-App Aftermarket.[568] Within the "Game" category (by far the largest), [redacted] in the In-App Aftermarket.

259. To the extent that some developers received discounts from Google's 30 percent take rate in the actual world, such discounts would be similarly negotiated in the competitive but-for world.[569] [redacted][570] This pricing structure, and Google's policy limiting negotiation of take rates with individual developers, implies class-wide impact, as all or almost all developers would pay a lower take rate in a more competitive world, and would pass on a portion of the savings to all or almost all Class members.[571] In Part VII below, I show how to compute damages for individual Class members based on their purchases; the data and inputs to these calculations are common to the Class.

G. Lower Prices Would Enhance Demand for Apps and In-App Content and Lower Take Rates Would Enhance the Supply of Apps and In-App Content Leading To Increased Output Relative to the Actual World

260. A foundational principle in economics is that "demand curves" are downward sloping—meaning that, all else equal, consumers will demand more of a product or service the lower its price.[572] How much more will be demanded depends on the consumer elasticity of the demand response to lower prices for Apps and In-App Content. As developers steer consumers to lower-cost app stores or payment processors in the but-for world via lower prices, consumers would respond by making more paid App downloads and purchases of In-App Content. This phenomenon can be understood graphically as a movement down the demand curve, resulting in higher output.

261. In a similar vein, the supply of Apps and In-App Content would increase as developers receive more for their Apps and In-App Content. Currently, developers receive only approximately 70 percent of the revenues generated from paid Apps and In-App Content in light of Google's take rate. Absent the Challenged Conduct, developers would realize larger proceeds, which would bring forward more App and In-App Content development, commensurate with a shifting out of the supply curve. Indeed, Google recognized that take-rate reductions, leading to higher revenues (price less commission) paid to developers, could increase output: In announcing its reduction in its commission to 15% for the first $1 million in revenue, Google's Vice President of Product Management explained that the new policy would provide "funds that can help

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568. *See* Table 3, *supra*, Row 6; see also Table 5, *supra*, Row 3.

569. Hal J. Singer and Robert Kulick, *Class Certification in Antitrust Cases: An Economic Framework*, 17 GEORGE MASON LAW REVIEW (2010); Hal Singer, *Economic Evidence of Common Impact for Class Certification in Antitrust Cases: A Two-Step Analysis*, 25(3) ABA'S ANTITRUST (2011).

570. Rosenberg Dep. at 123:22-124:23 (further testifying that [redacted]).

571. To illustrate, suppose that Google's overall take rate falls from 30 percent in the actual world to 20 percent in the but-for world. A developer paying a 15 percent take rate in the actual world would pay a take rate of 10 percent in the but-for world (equal to 15*(20/30). This lower take rate would then be passed on to Class members in the form of lower prices.

572. *See, e.g.,* GEORGE STIGLER, THE THEORY OF PRICE 23 (McMillan 3rd ed. 1987) ("The 'demand curve' is the geometrical expression of the relationship between quantity purchased and price, and our law of demand says that demand curves have a negative slope.").

developers scale up at a critical phase of their growth by hiring more engineers, adding to their marketing staff, increasing server capacity, and more."[573]

262. There is no reason why the markets for Apps and In-App Content are any different from other markets where demand increases as prices fall. Indeed, my estimated elasticities of demand confirm this relationship. Accordingly, a reduction in the prices to consumers of Apps and In-App Content, which would result from a removal of Google's anti-competitive restrictions in the two relevant antitrust markets, would translate directly into enhanced demand for Apps and In-App Content. Given the digital nature of the products in both markets and thus the largely fixed cost of supplying both products[574]—the initial App and In-App Content—increased demand would translate into additional output for both products.

263. To show the output effect for each year in the Class Period from 2016 through 2020 (the latest available annual data), I begin with the aggregate commissions paid by developers to Google. The average actual take rates on paid downloads in the Android App Distribution Market was [redacted] percent and the average actual take rates on paid purchases of In-App Content was [redacted] percent. According to my two-sided market model, the average competitive take rate in the Android App Distribution Market would be [redacted] percent. According to my economic model, the average competitive take rate in the In-App Aftermarket would be [redacted] percent.

264. Developers' prices to consumers are influenced by the take rate and the pass-through rate. A pass-through rate of 89.9 percent (which I estimate in Section V.D.3 and use in my analysis in Sections V.B and V.C) implies a new average price in the Android App Distribution Market of $3.67 and a new average price in the In-App Aftermarket of $7.65, as shown in Tables 3 and 5, respectively. Consequently, Class members on average would have spent $0.30 less per transaction in the Android App Distribution Market and $1.34 less per transaction in the In-App Aftermarket.

265. To convert the price reductions into output effects, I apply a price elasticity of demand for initial App downloads and In-App Content of 1.5, using the estimate of the market-wide elasticity of demand in the In-App Aftermarket as shown in Table 5.[575] Applying these estimates to the average price declines for purchases of Apps and In-App Content yields a 11.5 percent increase in initial downloads of paid Apps and a 22.3 percent increase in purchases of In-App Content, holding elasticity constant.[576] Accordingly, the Challenged Conduct can be said to have suppressed output relative to competitive but-for-world levels.

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573. Sameer Samat (Google Vice President, Product Management), *Boosting Developer Success on Google Play* (Mar. 16, 2021), *available at* android-developers.googleblog.com/2021/03/boosting-dev-success.html.

574. The marginal cost is the developers' marginal cost, plus the marginal cost of the record keeping, server hosting, auto updating, security, and authorization services that Google currently performs.

575. For the purpose of illustrating demand response I apply a single elasticity of 1.5 to each market, though separate elasticities for each market can be estimated. In addition, Ghose and Han (2014) estimate the elasticity of demand of Apps in the Android App Distribution Market at 3.7. *See* Anindya Ghose & Sang Pil Han, *Estimating Demand for Mobile Applications in the New Economy*, 60(6) MANAGEMENT SCIENCE 1470-1488 (2014).

576. In the Android App Distribution Market, an overcharge of $0.38 translates to a 9.6 percent decrease relative to the actual price of $3.97; the 9.6 percent decrease multiplied by an elasticity of 1.5 equals 14 percent. In the In-App Aftermarket, an overcharge of $1.34 translates to a 14.9 percent decrease relative to the actual price of $8.99; the 14.9 percent decrease multiplied by an elasticity of 1.5 equals 22 percent.

266. In addition to these direct output effects, the but-for world is likely to be characterized by increased innovation by software developers, which would redound to the benefit of consumers in the form of enhancements to quality, quantity, and consumer choice in both the Android App Distribution Market and In-App Aftermarket. For example, lower take rates would allow developers to reinvest to improve their products by "hiring more engineers, adding to their marketing staff, increasing server capacity, and more," just as Google recognized in launching its reduction in take rate for the first $1 million in developer revenue.[577] [redacted] Increased competition would also allow developers to meaningfully improve the quality of their payment solutions. [redacted]

267. Because the counterfactual experiment lies at the heart of antitrust analysis,[580] which involves comparing actual output against output but for the Challenged Conduct, output effects can occur even against a background of expanding output in the relevant market.[581] Output effects here take the form of fewer Apps downloaded and fewer purchases of In-App Content than would have otherwise occurred. Because the demand for such goods falls as their prices rise (that is, the demand curves slope downward), it follows that output contracted, even though in the In-App Aftermarket we observe output increasing over the Class Period. In other words, the but-for competitive output curves sit strictly above the actual output curves, illustrated in Figures 8 and 9 below.

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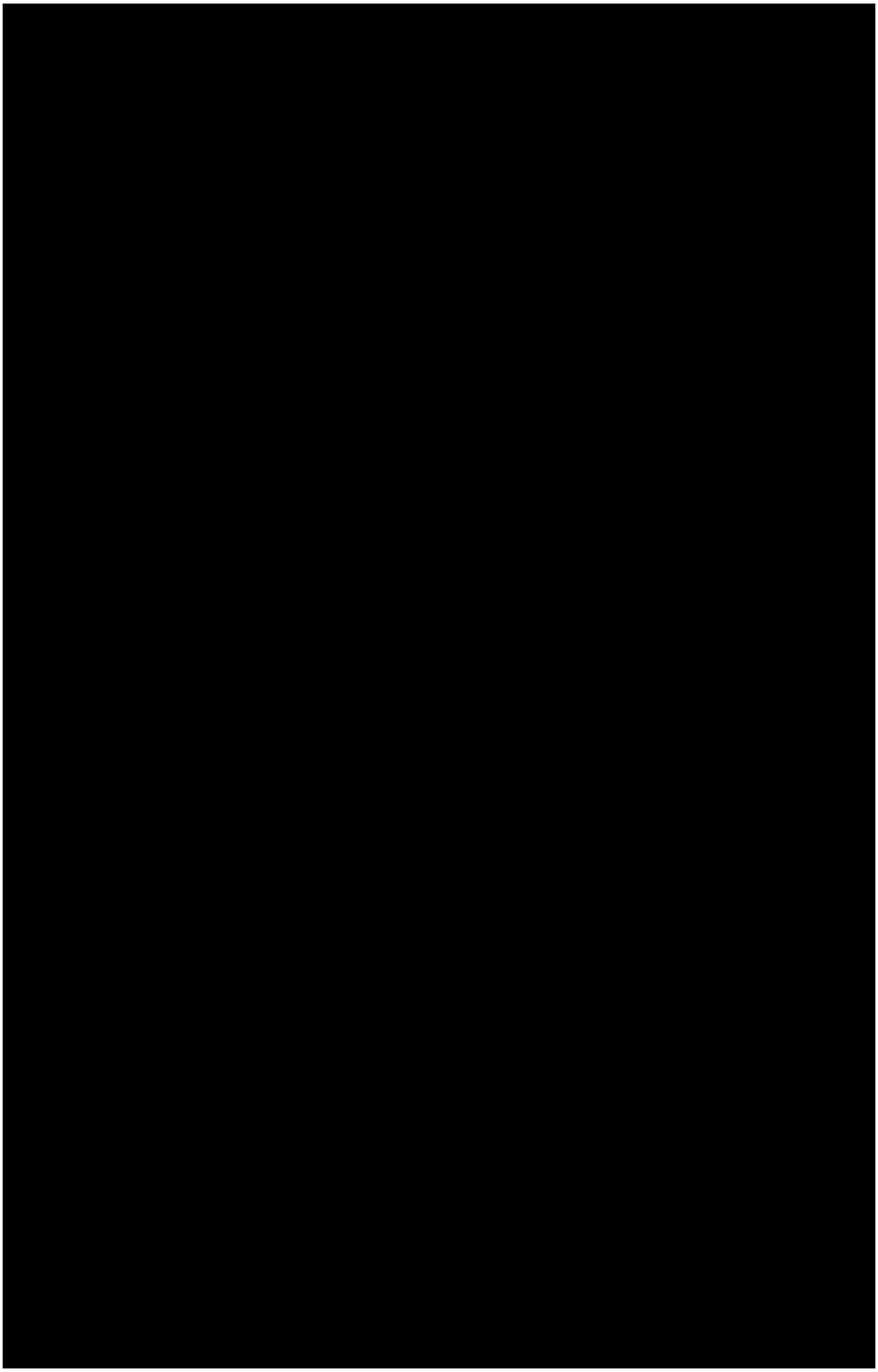
577. Sameer Samat (Google Vice President, Product Management), *Boosting Developer Success on Google Play* (Mar. 16, 2021), *available at* android-developers.googleblog.com/2021/03/boosting-dev-success.html.

578. GOOG-PLAY-002358233 at GOOG-PLAY-002358236.

579. GOOG-PLAY-001088593, at GOOG-PLAY-001088596.

580. Theon van Dijk & Frank Verboven, *Quantification of Damages*, in 3 ISSUES IN COMPETITION LAW AND POLICY 2331, 2332 (ABA Section of Antitrust Law 2008) ("The difference between this counterfactual world and the actual world provides the measurement of damages").

581. John Newman, *The Output-Welfare Fallacy: A Modern Antitrust Paradox*, 107(2) IOWA L. REV. (2022 forthcoming) (explaining the "The trial court found_that_AmEx's no-steering rules had increased retail prices for nearly every consumer product sold in the United States (among other ill effects)," implying output effects per the appropriate counterfactual exercise.).



H. In the Competitive But-For World, Google Would Still Make a Profit from the Play Store

268. Eliminating Google's anticompetitive restraints would allow developers to use alternative app stores and be free from the first download onward to choose a payment processor and other suppliers of services that support the purchase of In-App Content. *Ex ante* competition

to be an alternative source of Apps or to become a default payment processor for a developer would result in competitive take rates. And lower take rates would redound to the benefit of consumers in the form of lower prices, as developers competed for the loyalties of consumers.[582]

269. Eliminating the Challenged Conduct would result in Google earning smaller margins relative to what it currently earns. One can solve for the implied Play Store profits in my competitive but-for world. For example, in 2020, excluding advertising revenue, and assuming Google preserves a 60 percent market share, the Play Store would have earned gross profit of $[redacted] in the competitive but-for world. Assuming conservatively that operating expenses and infrastructure costs would have remained the same in the competitive but-for world, the Play Store still would have earned [redacted] in operating profit in the competitive but-for world (again excluding advertising). Once advertising is included, the Play Store's 2020 but-for profit is [redacted][583] Performing analogous calculations for 2021, the Play Store would have earned an estimated gross profit of [redacted] and operating profit of [redacted] in the competitive but-for world (again excluding advertising). Once advertising is included, the Play Store's 2021 but-for profit is estimated at [redacted][584]

I. In the Absence of the Challenged Conduct, Google Would Refrain from Imposing a Fee on Consumers for Initial Downloads, Including on Free Apps

270. Because a large user base is critical, two-sided digital platform operators, such as Google, are often incentivized to provide free access to users or even to subsidize access to users.[585] This approach allows two-sided digital platforms to get "both sides on board." Encouraging use of the platform by one group may come at a cost to the platform operator, but it serves to attract the group on the opposite side of the platform.[586] In the instant setting, allowing consumers to browse the Play Store for free and download free apps creates a benefit to Google above the cost to create and maintain the app store due to the indirect network effects in attracting more developers and additional money Google can make by attracting advertisers. Google's network-driven incentive to "capture" as many users as possible by drawing them into the Google ecosystem (including the GMS suite) would not change in the absence of its anticompetitive conduct. Google would continue to benefit from indirect network effects even without its various restrictions—the more Apps it can attract, the more consumers will come to its platform—although its take rates on positively-priced Apps would be lower. However, any reduction in revenue from a lower take rate would be more than offset by the advertising revenue generated from maintaining its user base.

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582. In the face of regulatory pressure, Google recently announced that it will it allow users in South Korea to use different in-app payment options, including in-app payment systems developed by app developers; Google will consequently decrease its take rate by four percentage points (from 15 percent to 11 percent). *See* Yoon Seon-hoon, *Google to abide by the 'forced in-app payment law'*, iNews24 (Nov. 4, 2021), *available at* n.news.naver.com/article/031/0000633296. In the competitive world contemplated here, Google would not be able to impose a take rate on in-app transactions unless Google were selected to be the payment processor by the developer.

583. GOOG-PLAY-000416245, GOOG-PLAY-001090227.

584. GOOG-PLAY-010801680, GOOG-PLAY-010801682.

585. *See, e.g.,* Thomas Eisenmann, Geoffrey Parker, and Marshall W. Van Alstyne, *Strategies for Two-Sided Markets*, HARVARD BUSINESS REVIEW 3-4, (2006) ("Because the number of subsidy-side users is crucial to developing strong network effects, the platform provider sets prices for that side below the level it would charge if it viewed the subsidy-side as an independent market."). *See also* Mark Armstrong & Julian Wright, *Two-sided markets, competitive bottlenecks and exclusive contracts*, 32 ECONOMIC THEORY 353-380, 359 (2007) ("If attracting one group (say buyers) makes the platform particularly attractive to the other group (say sellers), then buyers will be 'subsidized.'").

586. Rochet & Tirole at 991 (2003).

Google also would continue to obtain information about users, just as it does from its other apps in its GMS suite, which the company monetizes through the delivery of targeted ads to users.

271. Accordingly, Google likely would not impose even a modest fee on consumers for downloads of free Apps. Any attempt by Google to impose a transaction fee on consumers for free downloads would run counter to the company's basic business model and history to provide a widening array of free Apps or functionalities—such as Search, Maps, Gmail, You Tube, Chrome, and other Apps in its GMS suite—to consumers, but then collecting and monetizing information from consumers to realize and improve Google's targeted digital advertising. Imposing a fee on initial downloads would discourage consumers from downloading Apps through the Play Store, which in turn would jeopardize advertising revenues from the Play Store. [redacted][587] Getting users on the Play Store lifts Google's advertising revenues above and beyond those earned on the Play Store, as those users are more inclined to remain in an Android environment, supporting other Google Apps. [redacted][589]

272. Moreover, many Apps may be considered "experiential products,"[590] meaning that a consumer cannot discover its usefulness until they have downloaded the App and explored its functionalities. That consumers are accustomed to downloading Apps for free likely explains consumers' observed sensitivity to prices for paid Apps.[591] Imposing a fee on formerly free Apps would undermine this discovery process and thereby lower the value of the Play Store for consumers. Discouraging consumers from installing new Apps would also undermine the indirect network effects that Google is trying to harness—namely, a large customer base that attracts more developers to its platform and generates more advertising revenue. Google would still have an incentive to provide consumers access to free Apps (to try the Apps) because that is what sells the Apps and leads to purchases of paid In-App Content. In this respect, developers' and Google's incentives are aligned, competitive take rate or not. There is no reason to believe the business model of free initial App downloads would be eliminated because both Google and developers still want consumers to try and get hooked on Apps.

273. When Google cut its take rate from 30 percent to 15 percent for subscriptions longer than a year in 2018, or for all subscription revenue in 2022, it did not seek to offset the lost revenue by charging for Apps that were once free. Similarly, Google did not announce any increase in the

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587. GOOG-PLAY-001090227.

588. Statista, *Advertising revenue of Google from 2001 to 2020*, *available at* www.statista.com/statistics/266249/advertising-revenue-of-google/ ("In 2020, Google's ad revenue amounted to 146.92 billion US dollars…Advertising accounts for the majority of Google's revenue, which amounted to a total of 181.69 billion U.S. dollars in 2020."). *See also* GOOG-PLAY-004113976 at GOOG-PLAY-004113979 (a 2015 presentation showing that "Core Ads" were responsible for 87 percent of total revenue).

589. Rosenberg Dep. at 410:8-413:14.

590. *See, e.g.*, Allison Kidd, *Technology experiences: what makes them compelling?*, HPLabs Technical Report (2001).

591. Anindya Ghose & Sang Pil Han, *Estimating Demand for Mobile Applications in the New Economy*, 60(6) MANAGEMENT SCIENCE 1470-1488 (2014) (estimating an elasticity of demand among users of the Play Store of -3.7).

take rate in the Android App Distribution Market in conjunction with its plans to offer a 15 percent take rate on the first $1 million in revenue for all developers in 2021. This evidence suggests that, in the competitive but-for world where Google would have to lower its take rate due to competition, it would still not seek to offset the lost revenue by charging consumers for downloading previously free Apps.

VI. ESTIMATION OF AGGREGATE DAMAGES CAN BE PERFORMED WITH COMMON METHODS AND EVIDENCE

274. Class members' aggregate damages are computed using the overcharges calculated in Parts V.B (Table 3) and V.C (Table 5). These damages are presented in Table 11. In Appendix 6, I break down these damages by U.S. state and territory.

TABLE 11: AGGREGATE DAMAGES SUMMARY, 8/16/2016 – 12/31/2020

		Android App Distribution Market (Table 3)	In-App Aftermarket (Table 5)	Total
[1]	Actual Consumer Price	[redacted]		
[2]	Competitive But-For Consumer Price			
[3] = [1]-[2]	Overcharge			
[4]	Quantity Purchased			
[5]	Aggregate Damages			

Notes: Total prices and overcharge are weighted averages across both markets. Quantities reflect paid transactions only.

275. Table 12 summarizes aggregate damages in the combined Android App Distribution Market and In-App Aftermarket under the modeling scenario where the locus of competition is on the consumer subsidy (as presented in Section V.E and Table 10), and under the combined markets take rate competition model, where competition occurs only with respect to the take rate in a single, combined market (as presented in Appendix 4 and Table A4).

TABLE 12: AGGREGATE DAMAGES SUMMARY, PLAY POINTS AND SINGLE MARKET TAKE RATE MODEL, 8/16/2016 – 12/31/2020

		Play Points Competition (Table 10)	Take Rate Competition (Table A4)
[1]	Actual Consumer Price	[redacted]	
[2]	Competitive But-For Consumer Price		
[3] = [1]-[2]	Overcharge		
[4]	Quantity Purchased		
[5]	Aggregate Damages		

Note: Quantities reflect paid transactions only.

VII. ESTIMATION OF CLASS-MEMBER-SPECIFIC DAMAGES CAN BE PERFORMED WITH COMMON METHODS AND EVIDENCE

276. I present a formula for computing a given Class member's damages based on the member's purchase history. While individual damages will depend on the individual purchases made by each consumer, the methodology for computing Class member-specific damages is common to the Class.[592]

277. An individual consumer's damages are equal to the quantity purchased of each product multiplied by the difference between the actual and but-for price paid for her purchases in the Android App Distribution Market and the In-App Aftermarket. Mathematically, individual damages can be expressed as:

$$\text{Damages} = \sum_i OC\_AD_i \times Q\_AD_i + \sum_j OC\_AM_j \times Q\_AM_j$$

where OC_AD_i represents the overcharge in the Android App Distribution Market (for paid apps)—that is, difference between the actual price and the but-for price. The term Q_AD_i represents the actual quantity purchased by a Class member in the Android App Distribution Market. Similarly, OC_AM_j represents the overcharge in the In-App Aftermarket (for In-App Content), and Q_AM_j represents the actual quantity purchased by a Class member in the In-App Aftermarket.[593]

278. The actual purchase quantities for each Class member (Q_AD_i and Q_AM_j) are reported in Google's transactional data. The overcharges are calculated from the economic models reviewed above. Specifically, OC_AD_i is calculated using the two-sided market model presented in Section V.B, and OC_AM_j is calculated using the one-sided market model presented in Section V.C.

279. The overcharges depend on (1) how much the take rate falls in the competitive but-for world; and (2) the extent to which the lower take rate is passed on in the form of lower prices. With respect to (2), I have calculated pass-through rates for different developer categories in Section V.D above. A Class member's damages will therefore depend on the category of apps that the customer purchased. All else equal, the higher is the pass-through rate of the category purchased by a particular Class member, the higher that Class member's damages will be.

280. With respect to (1), the drop in the take rate will often be similar or identical across categories: Most categories have similar (or identical) take rates in the actual world, and would also have similar (or identical) take rates in the but-for world. Nevertheless, I allow for variation in the but-for take rate across categories as follows: Suppose that the overall take rate is 30 percent in the actual world, and that a given category has an actual take rate of 29 percent. Suppose further that the overall but-for take rate is 20 percent. The category's but-for take rate would be calculated

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592. For ease of exposition and presentation, here I present Class member-specific damages based on a Class member's purchases within each of Google's 35 categories. However, the same common framework could also be applied at the level of the developer. Class member-specific damages would then be calculated based on a Class member's expenditures at different developers, instead of different categories.

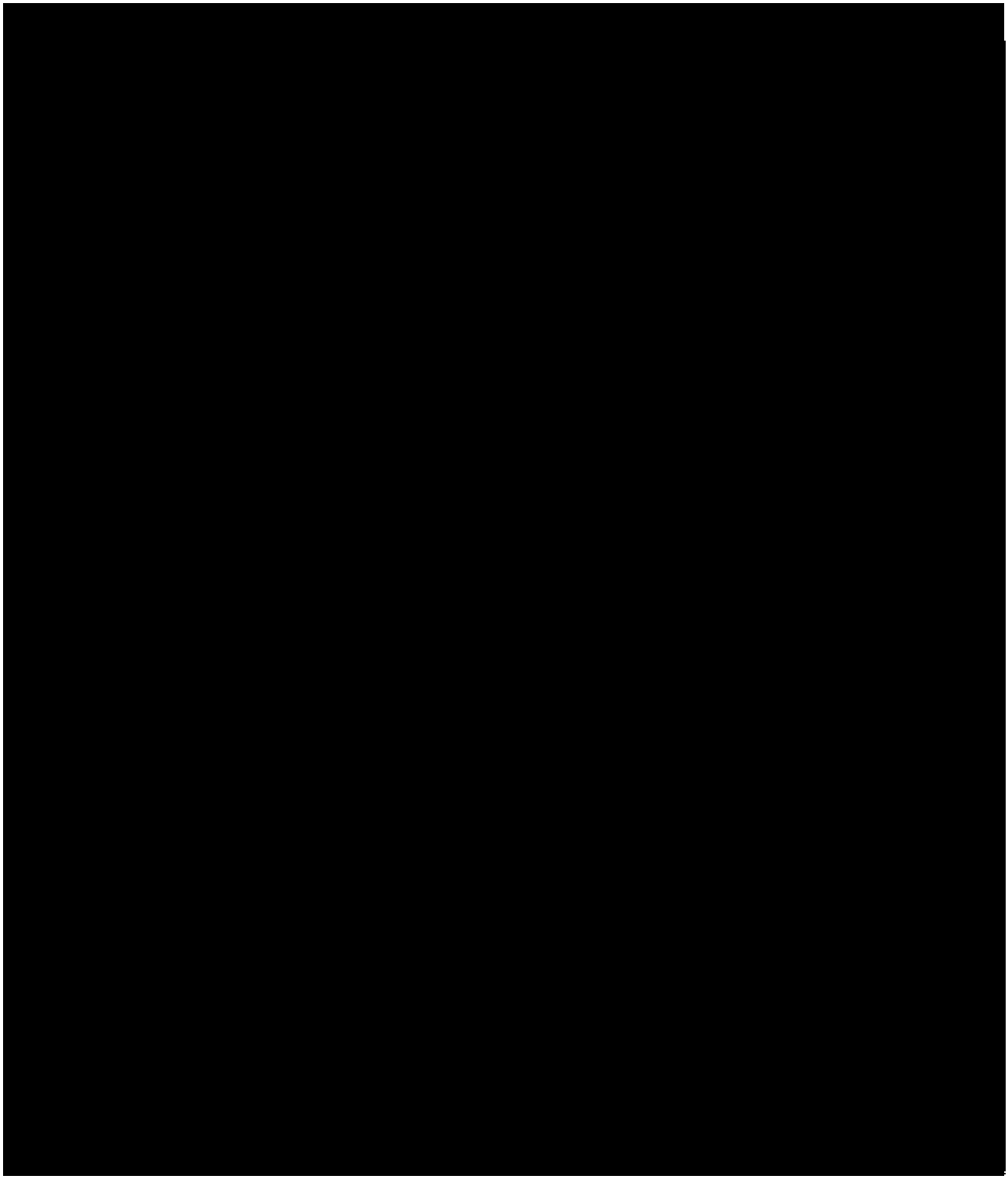
593. The summation operator ($\sum$) is used because a Class member may have multiple transactions in the Android App Distribution Market and the In-App Aftermarket.

as [20 percent] x [29 percent]/[30 percent] = 19.33 percent. More generally, a category's but-for take rate is permitted to deviate from the overall but-for take rate by the same proportion in which the category's actual take rate deviates from the average actual take rate.

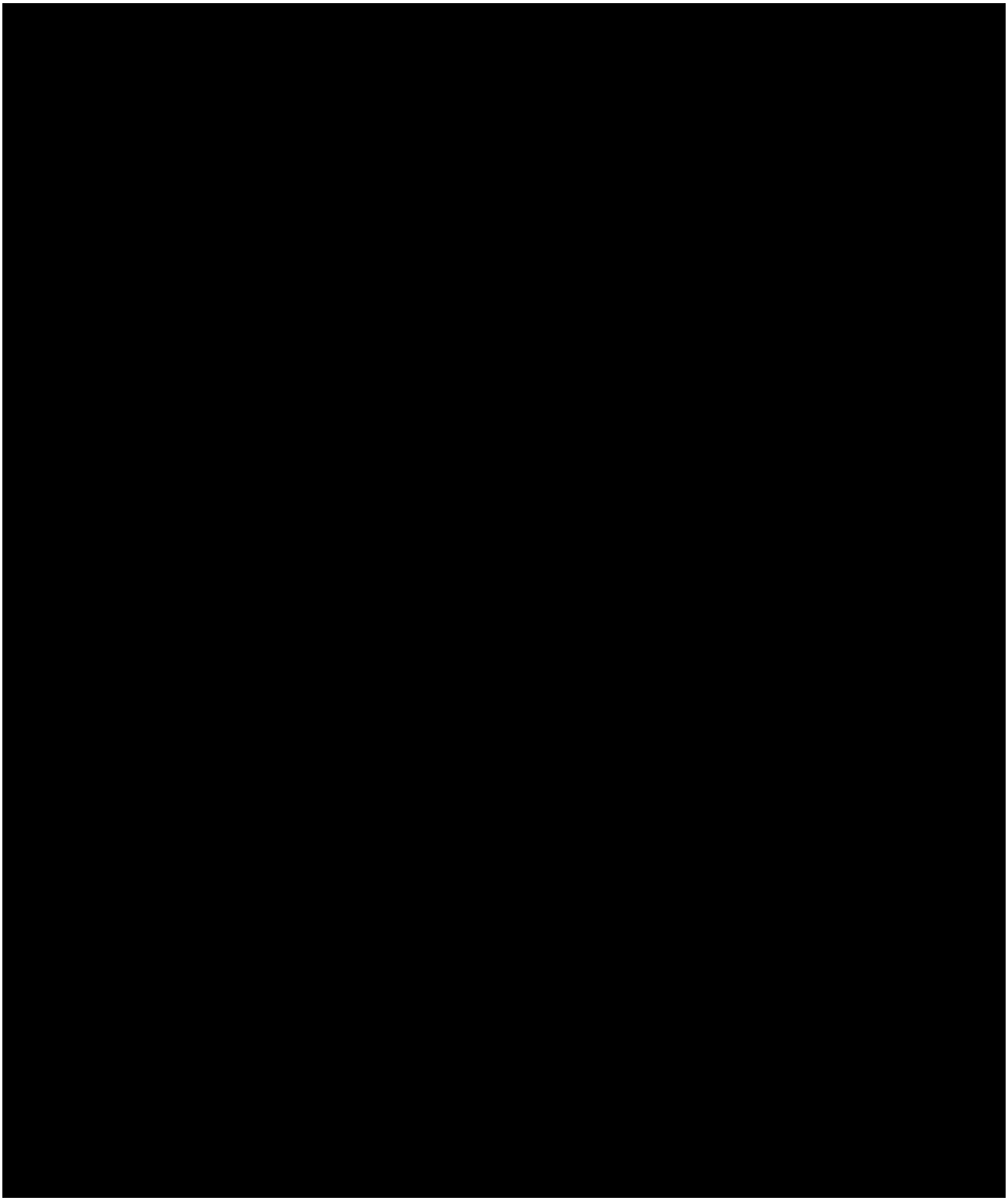
281. To illustrate, suppose that a consumer spent $10 on Apps in the "Art and Design" category in the Android App Distribution Market, as illustrated in the first row of Table 13 below. The actual take rate for the "Art and Design" category is 29.9 percent, and the but-for take rate for that same category is 23.2 percent. The pass-through rate for "Art and Design" is 67 percent. Given these inputs, the Class member's expenditures would fall to $9.47 in the but-for world. To see this, let P_b represent the consumer's but-for expenditures. Let t_a and t_b represent the actual and but-for take rates, and let γ be the pass-through rate. The difference between the Class member's actual and but-for expenditures is [$10 - P_b]. This difference satisfies the following equation:

$$[\$10 - P_b] = \gamma[\$10t_a - P_bt_b].$$

282. Solving for P_b, we obtain $P_b = \$10x([1- \gamma t_a]/[1 - \gamma t_b])$. Inserting the inputs from the "Art and Design" category, we have $P_b = \$10x([1- 0.67*0.299]/[1 - 0.67*0.232]) = \$9.47$. Thus, a Class member with $10 of expenditures in the "Art and Design" category of the Android App Distribution Market would have damages of $10 - $9.47 = $0.53. In other words, damages would equal 5.3 percent of expenditures (equal to $0.53/$10). Comparable calculations are performed for each remaining category in subsequent rows of Table 13.



283. Table 14 below performs comparable calculations for the In-App Aftermarket. For example, suppose that a Class member spent $10 on in-app purchases in the "Game" category. This category has an actual take rate of [redacted], a but-for take rate of 15.2 percent, and a pass-through rate of 92 percent. Applying the prior formula, the Class member's but-for expenditures [redacted] This yields damages of [redacted] for each $10 of Class member expenditures in the "Game" category of the In-App Aftermarket. In other words, damages would be [redacted] of expenditures (equal to [redacted]/$10).

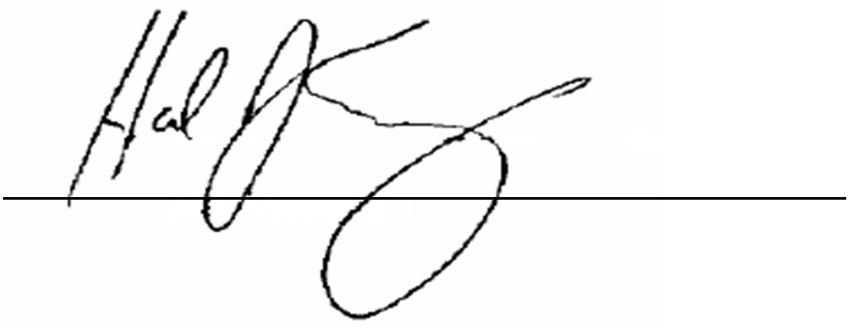


CONCLUSION

284. For the foregoing reasons, I conclude that the Challenged Conduct resulted in Class members overpaying for initial downloads from the Play Store and for the associated In-App Content.

* * *

Hal J. Singer, Ph.D.:



Executed on February 28, 2022.

APPENDIX 1: CURRICULUM VITAE OF HAL J. SINGER

econ ONE

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Education

Ph.D., The John Hopkins University, 1999; M.A. 1996, Economics

B.S., Tulane University, *magna cum laude*, 1994, Economics. Dean's Honor Scholar (full academic scholarship). Senior Scholar Prize in Economics.

Current Positions

ECON ONE, Washington, D.C.: Managing Director 2018-present.

GEORGETOWN UNIVERSITY, MCDONOUGH SCHOOL OF BUSINESS, Washington, D.C.: Adjunct Professor 2010, 2014, 2016, 2018, 2019, 2020, 2021, 2022.

GEORGE WASHINGTON UNIVERSITY, SCHOOL OF PUBLIC POLICY, GEORGE WASHINGTON INSTITUTE FOR PUBLIC POLICY, Washington, D.C.: Senior Fellow 2016-present.

Employment History

ECONOMISTS INCORPORATED, Washington, D.C.: Principal 2014-2018.

NAVIGANT ECONOMICS, Washington, D.C.: Managing Director, 2010-2013.

EMPIRIS, L.L.C., Washington, D.C.: Managing Partner and President, 2008-2010.

CRITERION ECONOMICS, L.L.C., Washington, D.C.: President, 2004-2008. Senior Vice President, 1999-2004.

LECG, INC., Washington, D.C.: Senior Economist, 1998-1999.

U.S. SECURITIES AND EXCHANGE COMMISSION, OFFICE OF ECONOMIC ANALYSIS, Washington, D.C.: Staff Economist, 1997-1998.

THE JOHNS HOPKINS UNIVERSITY, ECONOMICS DEPARTMENT, Baltimore: Teaching Assistant, 1996-1998.

Honors

Honoree, Outstanding Antitrust Litigation Achievement in Economics, American Antitrust Institute, *In re Lidoderm Antitrust Litigation,* Oct. 9, 2018.

Finalist, Outstanding Antitrust Litigation Achievement in Economics, American Antitrust Institute, *Tennis Channel v. Comcast*, Dec. 4, 2013.

Authored Books and Book Chapters

Do Municipal Broadband Networks Stimulate or Crowd Out Private Investment? An Empirical Analysis of Employment Effects, in THE IMPACT OF THE INTERNET ON JOBS (Lorenzo Pupillo, ed. Palgrave 2017).

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On the Utility of Surrogates for Rule of Reason Cases, COMPETITION POLICY INTERNATIONAL ANTITRUST CHRONICLE (2015), co-authored with Kevin Caves.

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P (FCC)

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In the Matter of 2014 Quadrennial Regulatory Review – Review of the Commission's Broadcast Ownership Rules and Other Rules Adopted Pursuant to Section 202 of the Telecommunications Act of 1996, MB Docket No. 14-50 (Federal Communications Commission)

Lindsay Kamakahi and Justine Levy, et al v. American Society for Reproductive Medicine and Society for Assisted Reproductive Technology, Case No.: 3:11-CV-1781 JCS (N.D. Cal.)

Salud Services, Inc. et al v. Caterpillar, Inc., Case No.: 1:12-cv-23927 (S.D. Fla.)

Gnanh Nora Krouch v. Wal-Mart Stores, Inc., Case No. CV-12-2217 (N.D. Cal.)

In the Matter of Petition for Rulemaking to Eliminate the Sports Blackout Rule, MB Docket No. 12-3 (Federal Communications Commission)

In the Matter of Review of Wholesale Services and Associated Policies, File No. 8663-C12-201313601 (Canadian Radio-Television and Telecommunications Commission)

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Altergy Systems v. Enersys Delaware, Inc., Case No. 74-198-Y-001772-12 JMLE (American Arbitration Association)

In re New York City Bus Tour Antitrust Litigation, Master Case File No. 13-CV-07I1 (S.D. N.Y.)

SOCAN Tariff 22.A (Online Music Services, 2011-2013), CSI Online Music Services (2011-2013), SODRAC Tariff 6 - Online Music Services, Music Videos (2010-2013) (Copyright Board Canada)

Imperial Premium Finance, LLC, v. Sun Life Assurance Company of Canada (S.D. Fla.)

The Satellite Television Law: Repeal, Reauthorize, or Revise? (U.S. House of Representatives, Committee on Energy and Commerce)

Marchbanks Truck Service, et al. v. Comdata Network Inc., et al., Civil Action No. 07-1078-JKG (E.D. Pa.)

Patricia Reiter v. Mutual Credit Corporation, et al., Case No. 8:09-cv-0081 AG (RNBx) (C.D. Cal.)

In re Photochromic Lens Antitrust Litigation, MDL Docket No. 2173 (M.D. Fla.)

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Memberships

American Economics Association

American Bar Association Section of Antitrust Law

Reviewer

Journal of Risk and Insurance

Journal of Competition Law and Economics

Journal of Risk Management and Insurance Review

Journal of Regulatory Economics

Managerial and Decision Economics

Telecommunications Policy

APPENDIX 2: MATERIALS RELIED UPON

BATES DOCUMENTS

AMZ-GP_00001497.
ATT-GPLAY-00000692
ATT-GPLAY-00002235
ATT-GPLAY-00002235
ATT-GPLAY-00012846
EPIC_GOOGLE_00108372
EPIC_GOOGLE_00123016
EPIC_GOOGLE_01389946
EPIC_GOOGLE_01747440
EPIC_GOOGLE_01747963
EPIC_GOOGLE_02075797
GOOG-PLAY-000416245
GOOG-PLAY-000000807
GOOG-PLAY-000001317
GOOG-PLAY-000001976
GOOG-PLAY-000003283.R
GOOG-PLAY-000004762.R
GOOG-PLAY-000005203
GOOG-PLAY-000005264
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GOOG-PLAY-000054021
GOOG-PLAY-000054039
GOOG-PLAY-000054683
GOOG-PLAY-000127155
GOOG-PLAY-000131205.R
GOOG-PLAY-000225435
GOOG-PLAY-000226999
GOOG-PLAY-000229696
GOOG-PLAY-000231487
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GOOG-PLAY-000258923
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GOOG-PLAY-000297309.R
GOOG-PLAY-000302766
GOOG-PLAY-000338849
GOOG-PLAY-000367346.R
GOOG-PLAY-000379093
GOOG-PLAY-000400751.R

GOOG-PLAY-000416245
GOOG-PLAY-000416448
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GOOG-PLAY-000417080
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GOOG-PLAY-000443908.R
GOOG-PLAY-000445443.R
GOOG-PLAY-000446626
GOOG-PLAY-000464148
GOOG-PLAY-000518034
GOOG-PLAY-000542516.R
GOOG-PLAY-000556954
GOOG-PLAY-000559379
GOOG-PLAY-000572041.R
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GOOG-PLAY-000808433
GOOG-PLAY-000808451
GOOG-PLAY-000832219
GOOG-PLAY-000832471
GOOG-PLAY-000840773
GOOG-PLAY-000879194.R
GOOG-PLAY-000879195R
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APPENDIX 3: EXTENSION OF TWO-SIDED MARKET MODEL

285. In what follows, I derive the expressions used in Parts V.B, V.E, and Appendix 4 for demonstrating impact in the particular two-sided setting relevant to the instant case. This "applied" modeling is an extension of the "foundational" model in Rochet and Tirole 2003. I discuss two cases: (1) a case where competition occurs only with respect to the take rate t, and (2) a case where competition occurs only with respect to the buyer-side price P_B.

286. In Rochet and Tirole 2003, the monopolist platform operator maximizes profit (denoted π^0) defined as:

(A.1) $$\pi^0 = (P_B + P_S - C)D_B(P_B)D_S(P_S)$$

where P_B and P_S are buyer- and seller-side platform prices, respectively; C is marginal transaction cost, and $D_B(P_B)$ and $D_S(P_S)$ are demand functions for buyers and sellers, respectively.[594] I extend the model (1) to accommodate Google charging a percentage take rate on the developer (seller) side, (2) to allow the average App or In-App Content (product) price (set by developers) to be a function of the take rate, and (3) to allow consumer (buyer) demand to be a function of the net App or In-App Content (product) price, defined as the sum of the product price and the platform price. The new profit function (denoted π) can be written as:

(A.2) $$\pi = (P_B + tS(t) - C)D_B(S(t) + P_B)D_S(t)$$

where $S(t)$ is the price of paid App downloads and t is the take rate or portion of consumer spend that is retained by Google.

287. Before continuing the exposition, it is useful to define the pass-through parameter γ which I refer to throughout:

(A.3) $$\gamma = \frac{\Delta SQ}{\Delta vQ} = \frac{\Delta S}{\Delta v}$$

where ΔS is the dollar change in product price to consumers and Δv is the dollar change in costs (including commissions paid to Google) to developers.

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594. Rochet & Tirole at 996.

A. Case 1: Platform Operator Maximizes Profit Only With Respect to the Take Rate (Buyer-Side Platform Price Is Held Fixed)

288. In this subsection, I present the derivations used to arrive at Equations (V.3) and (V.5) in the report. If the platform operator maximizes profit with respect to the take rate, holding the buyer-side platform price fixed, the following first-order condition[595] follows from (A.2):

(A.4) $$\frac{S + tS'}{P_B + tS - C} - \frac{\varepsilon_{B,t}}{t} - \frac{\varepsilon_{S,t}}{t} = 0$$

where S' is the change in the product price with respect to the take rate, and the "take-rate elasticities" are:

(A.5) $$\varepsilon_{B,t} = -\frac{tS'D_B'}{D_B}$$

(A.6) $$\varepsilon_{S,t} = -\frac{tD_S'}{D_S}$$

D_B' and D_S' are first derivatives of the buyer and seller demand functions. Re-arranging (A.4):

$$\frac{S + tS'}{P_B + tS - C} = \frac{\varepsilon_{B,t} + \varepsilon_{S,t}}{t}$$

Inverting each side:

$$\frac{P_B + tS - C}{S + tS'} = \frac{t}{\varepsilon_{B,t} + \varepsilon_{S,t}}$$

Dividing by t gives Equation (V.3):

(A.7), (V.3) $$\frac{P_B + tS - C}{tS + t^2S'} = \frac{1}{\varepsilon_{B,t} + \varepsilon_{S,t}}$$

Let k be a developer's marginal cost. The per-unit cost to developers from the take rate is equal to $tS(t)$, implying that the change in marginal cost resulting from a change in the take rate is $\frac{\partial k}{\partial t} = S(t) + tS'(t)$. Setting $\Delta v = S(t) + tS'(t)$ and $\Delta S = S'(t)$ (the changes in price and cost, respectively, resulting from a change in the take rate) in expression (A.3) gives $\gamma = \frac{S'(t)}{S(t)+tS'(t)}$. Re-arranging gives the following expression for $S'(t)$:

(A.8) $$S'(t) = \frac{\gamma}{1 - t\gamma}S(t)$$

595. A first-order condition describes the point at which profit maximization is achieved and is a commonly used tool in economic modeling. *See, e.g.,* JEFFREY M. PERLOFF, MICROECONOMICS A-34 (Pearson 7th ed. 2015). As in Rochet and Tirole, I apply the log-transform to the profit function, then take the derivative with respect to t.

289. In a monopoly setting, elasticities reflect that the platform operator faces no competition. In a competitive setting, profit is maximized with respect to "residual" demand, defined as the demand curve faced by the platform operator in the presence of competition.[596] To determine the competitive equilibrium condition, I replace demand functions $D_B(S(t) + P_B)$ and $D_S(t)$ in expression (A.2) with residual demand functions and repeat steps (A.4) through (A.7). Residual demand functions are formally defined as the difference between market demand and the quantity being supplied by the firm's rivals:

(A.9) $$RD_B(S(t) + P_B) = D_B(S(t) + P_B) - Q_{R,B}(S(t) + P_B)$$

(A.10) $$RD_S(t) = D_S(t) - Q_{R,S}(t)$$

where $Q_{R,B}(S(t) + P_B)$ and $Q_{R,S}(t)$ represent the amount of product supplied by the platform's rivals at price $S(t) + P_B$ and take rate t.[597] Steps (A.4) through (A.7) using the residual demand curves then give the analogous competitive expression used in Equation (V.5):

(A.11), (V.5) $$\frac{P_B + tS - C}{tS + t^2S'} = \frac{1}{\varepsilon_{OB,t} + \varepsilon_{OS,t}}$$

where $\varepsilon_{OB,t}$ and $\varepsilon_{OS,t}$ are "own-brand" elasticities on the buyer (consumer) and seller (developer) sides, respectively, reflecting the change in quantity demanded from consumers for transaction on the firm's (Google's) platform in response to a change in the take rate and in the presence of competition.

290. To solve for the product price in the competitive setting, I use the pass-through equation (A.3), and note that the change in the total commissions (from $t^M S^M$ to $t^C S^C$) from a change in the take rate satisfies:

(A.12) $$\gamma = \frac{\Delta S}{\Delta v} = \frac{S^M - S^C}{t^M S^M - t^C S^C}$$

where superscripts ^{M} and ^{C} denote the monopoly and competitive cases, respectively. Re-arranging allows expression of the product price in the competitive world in terms of the competitive take rate and monopoly inputs:

(A.13), (V.8) $$S^C = S^M \frac{1 - \gamma t^M}{1 - \gamma t^C}$$

596. *See, e.g.,* Landes & Posner at 985.
597. *Id.*

Using this expression, I can then solve for the competitive take rate that satisfies (A.10), having estimated the other inputs (S^M, C, and competitive elasticities).

B. Case 2: Platform Operator Maximizes Profit Only With Respect to the Buyer-Side Platform Price (Take Rate Is Held Fixed)

291. Using the same objective function (A.2) but maximizing profit with respect to the buyer-side platform price yields the following first-order condition, now taken with respect to P_B:

(A.14) $$\frac{1}{P_B + tS(t) - C} - \frac{\varepsilon_B}{(S + P_B)} = 0$$

where ε_B is the price elasticity of demand for App products (taken with respect to the net price $S + P_B$):

(A.15) $$\varepsilon_B = -\frac{(S + P_B)D_B{}'}{D_B}$$

Re-arranging (A.13) gives Equation (V.11):

(A.16), (V.11) $$\frac{P_B + tS - C}{S + P_B} = \frac{1}{\varepsilon_B}$$

292. To solve for the competitive equilibrium condition, I replace demand functions $D_B(S(t) + P_B)$ and $D_S(t)$ with residual demand functions (defined in Equations A.9 and A.10) in expression (A.2) and repeat steps (A.14) through (A.16). This gives the competitive expression used in Equation (V.12):

(A.17), (V.12) $$\frac{P_B + tS - C}{S + P_B} = \frac{1}{\varepsilon_{OB}}$$

Note that the product price elasticity of demand is related to the *take rate* elasticity of demand (given by Equation (A.5)):

$$\varepsilon_B = -\frac{tS'D_B'}{D_B} * \frac{(S + P_B)}{S'}$$

or

(A.18) $$\varepsilon_B = \varepsilon_{B,t}\frac{(S + P_B)}{tS'}$$

The analogous expression using own-brand elasticities is:

(A.19) $$\varepsilon_{OB} = \varepsilon_{OB,t}\frac{(S + P_B)}{tS'}$$

APPENDIX 4: RESULTS OF THE SINGLE MARKET TAKE RATE MODEL

293. In Section V.B I present a model in which the locus of platform competition in the Android App Distribution Market was the take rate. That is, absent Google's anticompetitive restrictions, I model the extent to which Google would lower its take rate in response to competition. In this model, I hold the buyer-side subsidy fixed at its observed proportion to the paid App download price. In Section V.E I presented an alternative model in which Google increases its loyalty points program for consumers to encourage their use of the Play Store and Google Play Billing rather than using a competing source of Apps or In-App Content. In this buyer-side platform competition model, I model competition with respect to a single per-unit consumer subsidy across both initial paid App downloads and purchases of In-App Content, as Google's present (though small in magnitude) loyalty points program uses this structure (rather than having two different points programs). In this model, I hold the take rate fixed at its observed monopoly level.

294. Here I present a third scenario (the "single market take rate model") where competition occurs only with respect to a take rate (holding the buyer-side subsidy fixed) that applies to a single combined market. The single market take rate model follows the same steps as the Android App Distribution Market take rate model presented in Part V.B; however, in the single market take rate model presented here, the platform operator maximizes profit by choosing a take rate that applies to all transactions (both initial downloads and in-App purchases). Because of this distinction, input values differ across models.

295. My sources and methods for obtaining the monopoly scenario inputs shown in Equation (V.3) are:

- P_B^M is equal to the (negative) price charged by Google to consumers for transactions made on its platform in the monopoly scenario. I compute the average value of this price as the sum of all promotions paid by Google for transactions made in both the Android App Distribution Market and In-App Aftermarket, divided by the total quantity of paid Apps downloaded in the Android App Distribution Market and purchases of In-App Content in the In-App Aftermarket, as observed in Google's transaction records.

- t^M is equal to the observed take rate, computed as the sum of all revenue retained by Google in the Android App Distribution Market and In-App Aftermarket divided by the sum of total revenue spent by consumers in the Android App Distribution Market and In-App Aftermarket (prior to Google's promotional expenditures, which are captured by P_B^M).

- S^M is equal to the average price charged for paid Apps in the Android App Distribution Market and In-App Content in the In-App Aftermarket in the monopoly setting, calculated as the total amount of revenue spent by consumers (prior to receiving promotions from Google) in the Android App Distribution Market and In-App Aftermarket divided by the total quantity of paid Apps downloaded in the Android App Distribution Market and purchases of In-App Content in the In-App Aftermarket, as observed in Google's transaction records.

- Marginal cost C represents the incremental cost incurred by Google in executing a transaction. I refer to Google's financial data to infer this value, [redacted]

[redacted]

- γ is equal to the change in the App price S charged to consumers with respect to a change in developers' costs (including the cost imposed on developers through Google's take rate), also known as the pass-through rate. This parameter is discussed in detail in Section V.D, where I estimate its value at 89.9 percent.

- S'^M represents the change in the product price resulting from a small change in the take rate. I solve for S'^M in terms of the take rate and pass-through rate: $S'^M = \frac{\gamma}{(1-t^M\gamma)}S^M$. Appendix 3 contains a derivation of this expression.

- $\varepsilon^M_{B,t}$ and $\varepsilon^M_{S,t}$ are the take-rate elasticities of demand for transactions in the Android App Distribution Market and In-App Aftermarket from consumers and developers, respectively, in the presence of Google's monopoly. Given the other inputs to the monopoly model, the value of the sum $\varepsilon^M_{B,t} + \varepsilon^M_{S,t}$ is implied by Equation (V.3).

296. I hold inputs C and γ fixed between the monopoly and competitive scenarios. My sources and methods for obtaining the remaining inputs to the competitive scenario expression shown in Equation (V.5) are:

- t^C is equal to the but-for (competitive) take rate. I solve for the but-for take rate by finding the value that satisfies Equation (V.5) given the remaining inputs.

- S^C is the price of paid App downloads and In-Ap Content that developers would charge in a competitive scenario. S^C can be calculated in terms of other inputs (S^M, t^M, t^C, γ) according to Equation (V.8).

- S'^C represents the change in the product price resulting from a small change in the take rate in the competitive setting. I solve for S'^C in terms of the take rate and pass-through rate: $S'^C = \frac{\gamma}{(1-t^C\gamma)}S^C$. Appendix 3 contains a derivation of this expression.

- $\varepsilon^C_{OB,t}$ and $\varepsilon^C_{OS,t}$ are the "own-brand" take-rate elasticities of demand for transactions in the Android App Distribution Market and In-App Aftermarket for consumers and developers, respectively, in the presence of competition. Following the same steps taken in Section V.B.3, I estimate that Google's take rate elasticities shift from a value of 2.11 (in the monopoly setting, as calculated using Equation (V.3)) to 2.49 in the competitive setting. Because this model is applied to the combined Android App Distribution Market and In-App Aftermarket, elasticity values vary slightly from those shown in Table 3 (which reflects the Android App Distribution Market only).

- P^C_B is equal to the (negative) price charged by Google to consumers for transactions made in the Android App Distribution Market and In-App Aftermarket in the competitive

598. *See* Section V.C, GOOG-PLAY-000416245 ([redacted]).

scenario. I hold the buyer-side platform price fixed in proportion to the product price: $P_B^C = \left(\frac{P_B^M}{S^M}\right) S^C$.

297. Table A4 shows the results of the single market take rate model. At a pass-through rate of $\gamma = 89.9$ percent, the resulting but-for average price of paid App downloads and In-App purchases is [redacted], down from the observed price of [redacted] (net of Google's promotional expenditures to consumers). This difference results in an average overcharge to consumers of [redacted], and aggregate damages of [redacted] (equal to [redacted] paid App and In-App purchase transactions made) as a result of Google's restrictions, across the Class Period (August 16, 2016, through December 31, 2020).

TABLE A4: SINGLE MARKET TAKE RATE MODEL, IMPACT AND DAMAGES
(8/16/2016 – 12/31/2020)

Actual World (Monopoly, Eqn. (V.3))

#	Input	Description	Value	Source/Notes
[1]		Consumer Expenditure (US)	[redacted]	GOOG-PLAY-005535886 (US Consumers)
[2]		Google Revenue (US)		GOOG-PLAY-005535886 (US Consumers)
[3]		Google Promotional Expenditures (US)		GOOG-PLAY-005535886 (US Consumers)
[4]		Android App Distribution (Paid) and In-App Aftermarket Transactions		GOOG-PLAY-005535886 (US Consumers)
[5]=[1]/[4]	S^M	App Product Price		Calculated
[6]=[2]/[1]	t^M	Take Rate		Calculated
[7]=-[3]/[4]	P_B	Buyer-side Platform Price		Calculated
[8]=[5]+[7]	$S^M + P_B$	App Product Price Net of Promotions		Calculated
[9]	C	Marginal Cost		GOOG-PLAY-000416245
[10]	γ	Pass-through rate		Estimated (See Table 8)
[11]	$\varepsilon^M_{B,t} + \varepsilon^M_{S,t}$	Take Rate Elasticities of Demand		Calculated (Eqn. (V.3))

But-For World (Competitive, Eqn. (V.5))

#	Input	Description	Value	Source/Notes
[12]	S^C	App Product Price	[redacted]	Calculated (Eqn.(V.8))
[13]	t^C	Take Rate		Calculated (Eqn.(V.5))
[14]=([7]/[5])*[12]	P_B	Buyer-side Platform Price		Calculated
[15]=[12]+[14]	$S^C + P_B$	App Product Price Net of Promotions		Calculated
[16]=[9]	C	Marginal Cost		GOOG-PLAY-000416245
[17]=[10]	γ	Pass-through Rate		Estimated (See Table 8)
[18]	$\varepsilon^C_{OB,t} + \varepsilon^C_{OS,t}$	Take Rate Elasticities of Demand		Economic theory/ empirical studies
[19]=[8]-[15]		Consumer Savings Per Transaction		Calculated
[20]=[19]*[4]		**Aggregate Damages**		Calculated

APPENDIX 5: STANDARD SSNIP TEST INDICATES IN-APP AFTERMARKET PURCHASES IS A RELEVANT ANTITRUST MARKET

298. In this Appendix, I assess whether the In-App Aftermarket constitutes its own relevant antitrust market. In this section, I use an industry standard market definition exercise to show it is indeed the case that it does

299. Economists and antitrust agencies use a market definition exercise to evaluate "a customer's ability and willingness to substitute away from one product to another in response to a price increase" by a hypothetical monopolist.[599] The DOJ and FTC's *Horizontal Merger Guidelines* define a relevant antitrust product market as a product or group of products that, if controlled by a hypothetical monopolist, could profitably sustain a small but significant and non-transitory increase in price ("SSNIP") over the competitive price level.[600] A SSNIP is usually assessed as a five-percent increase in price over competitive levels.[601]

300. Economists perform what is known as a "critical loss analysis" to assess the profitability of a SSNIP of five percent on a category of goods or services.[602] All else equal, raising a product's price increases its profit margin. But for virtually all products, higher prices also result in fewer sales. How *many* fewer sales a product earns in response to a change in price is a product's "own-price demand elasticity," which is defined as the percentage decrease in quantity demanded that results from a one-percent increase in price.[603] A critical loss analysis determines if a product has sufficient outside competition to deter a hypothetical monopolist from profitably raising prices. If not, the product is its own relevant antitrust market.

301. A critical loss analysis can be broken into three parts. First, an economist calculates the largest theoretical loss in sales (in percentage terms) a hypothetical monopolist could sustain above competitive levels before a five-percent price increase would become unprofitable. The critical loss formula is based on the profit margin of the hypothetical monopolist (in percentage terms) and the price increase being tested. For a five-percent price increase, the critical loss is calculated as:[604]

$$Critical\ Loss = \frac{5\%}{(Margin + 5\%)}$$

599. *Merger Guidelines* §4.

600. *Id.* §4.1.1.

601. *Id.* §4.1.2 ("The Agencies most often use a SSNIP of five percent of the price paid by customers for the products or services to which the merging firms contribute value. However, what constitutes a "small but significant" increase in price, commensurate with a significant loss of competition caused by the merger, depends upon the nature of the industry and the merging firms' positions in it, and the Agencies may accordingly use a price increase that is larger or smaller than five percent.").

602. *Merger Guidelines* §4.1.3. *See also* Daniel O'Brien and Abraham Wickelgren. *A critical analysis of critical loss analysis*, 71 ANTITRUST L.J. (2003) 161 [hereafter O'Brien & Wickelgren]; Michael Katz and Carl Shapiro. *Critical loss: Let's tell the whole story*, ANTITRUST 17 (2002) 49.

603. For example, a product with an own-price demand elasticity of two would see sales drop by two percent for every one-percent increase in price.

604. O'Brien & Wickelgren at 10, Equation 4.

Above, *Margin* gives the hypothetical monopolist's initial price-cost margin at the competitive price. For example, if the competitive margin is 25 percent, a hypothetical monopolist would have a critical loss of (0.05/(0.25+.05)) = 0.167, or 16.7 percent. If the hypothetical monopolist raised its price by five percent above the competitive level, the price increase would be profitable so long as the hypothetical monopolist lost no more than 16.7 percent of its sales.

302. Second, an economist would then estimate the *actual* losses the hypothetical monopolist would face if it raised prices by five percent. To calculate actual losses, an economist estimates the hypothetical monopolist's own-price elasticity of demand for the products in question, as well as the cross-price elasticity of demand for other products owned by the monopolist (if any) that a consumer might switch to in response to a price increase on the first set of products. For a five percent price increase, actual loss is calculated as:

$$Actual\ Loss = 5\% * (\varepsilon_{Own} - \varepsilon_{Cross})$$

For example, a firm with an own-price elasticity of two and no cross-price elasticity would face an actual loss of (.05*2) = 0.1, or 10 percent. The cross-price elasticity is irrelevant here since Google does not own another app store aside from the Play Store (or another payment processor aside from Google Play Billing). Hence, I conservatively set ε_{Cross}= 0.

303. Finally, an economist compares the critical loss and the actual loss. So long as the actual loss is below the critical loss, the price increase would be profitable to the hypothetical monopolist. If the price increase is profitable, it implies that the products controlled by the hypothetical monopolist do not have sufficient outside substitutable alternatives to defeat an exercise of market power. The SSNIP test would therefore indicate that the products in question represent a relevant antitrust market.

304. Economists may use a SSNIP test prospectively, such as in merger cases where a SSNIP test is used to analyze whether a merged firm could profitably rise prices and could harm consumer welfare. The SSNIP test can also be used retroactively, including in cases where a not-so-hypothetical monopolist already commands the markets in question, as is the case here.[605] A retroactive SSNIP test has the potential to underestimate a firm's market power, since the prices and margins in the actual world may be contaminated by the Challenged Conduct.[606]

305. To perform a one-sided SSNIP test for the In-App Aftermarket, I start by empirically estimating Google's actual-world own-firm demand elasticity for the In-App Aftermarket. I used standard multiple regression methods. Specifically, I regressed the natural logarithm of quantity demanded of In-App Content on the natural logarithm of Google's take rate in dollars (the price Google charges for facilitating the transaction). I include App-specific fixed effects and uses taxes as an exogenous instrument. This yields an own-firm demand elasticity of

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605. OECD Policy Roundtable, *Market Definition 2012,* Organisation for Economic Co-operation and Development (October 11, 2012) at 40, *available at* www.oecd.org/daf/competition/Marketdefinition2012.pdf ("In monopolisation cases or in cases of an abuse of a dominant position, the potential anticompetitive effects may already have occurred. As a result, the analysis may be retrospective and the prevailing price may already be higher as compared to the but-for price.").

606. *Id.* This is known as the "Cellophane Fallacy," named after the US Supreme Court case in *United States v EI du Pont de Nemour and Co*. Briefly, the court "fail[ed] to recognise that the prices on which the market definition was based were already tainted by the infringement. In other words, the market definition proceeded prospectively, as if in a merger case, not taking the (at least partial) retrospective effects of the alleged infringement into account."

1.88 at Google's present market share of 97 percent, implying a market demand elasticity of 1.88*0.97 =1.82. This yields an estimate of the demand elasticity that would be faced by a hypothetical monopolist with a market share of 100 percent in the In-App Aftermarket.[607] I note that this independent econometric estimate is very much in line with the market demand elasticity of 1.50 used in my economic model of In-App Aftermarket, summarized in Table 5 above. For purposes of the SSNIP test, I conservatively employ the greater of these two estimates (1.82 rather than 1.50).[608]

306. Actual loss is calculated using a SSNIP of five percent, multiplied by the market demand elasticity:

[redacted]

A hypothetical monopolist in the In-App Aftermarket could profitably raise prices above competitive levels as long as the actual loss is less than the critical loss. This will be the case as long as the competitive margin is less than 50 percent.[609] As demonstrated in my economic model of the In-App Aftermarket, summarized in Table 5 above (Row 15), [redacted]

Because the actual loss is below the critical loss, a hypothetical monopolist could profitably impose a SSNIP above competitive levels in the In-App Aftermarket.

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607. The market demand elasticity is given by the equation $E_g = \frac{E_M}{S_g} + \frac{E_S(1-S_g)}{S_g}$. (Landes & Posner at 944-945.) In the actual world, $E_s = 0$ because competitive rivals are constrained by Google's tie. Therefore, $E_M = E_g S_g$. *See, e.g.,* MICHAEL KATZ AND HARVEY ROSEN, MICROECONOMICS 3rd ed. 329-330 (Irwin/McGraw-Hill 1998).

608. Using the higher estimate is conservative because a greater market elasticity yields a greater actual loss. All else equal, this makes it less likely that a SSNIP would be profitable, because the SSNIP is profitable when the critical loss exceeds the actual loss.

609. Setting critical loss equal to actual loss, we obtain: 5%/(*Margin* + 5%) = 9.1%. The equation is balanced when *Margin* = 50%. The actual loss of 9.1 percent will be less than the critical loss as long as *Margin* < 50%.

APPENDIX 6: DAMAGES BY STATE

TABLE A6.1: BY STATE COMBINED ANDROID APP DISTRIBUTION AND IN-APP AFTERMARKET DAMAGES (8/16/2016 – 12/31/2020)

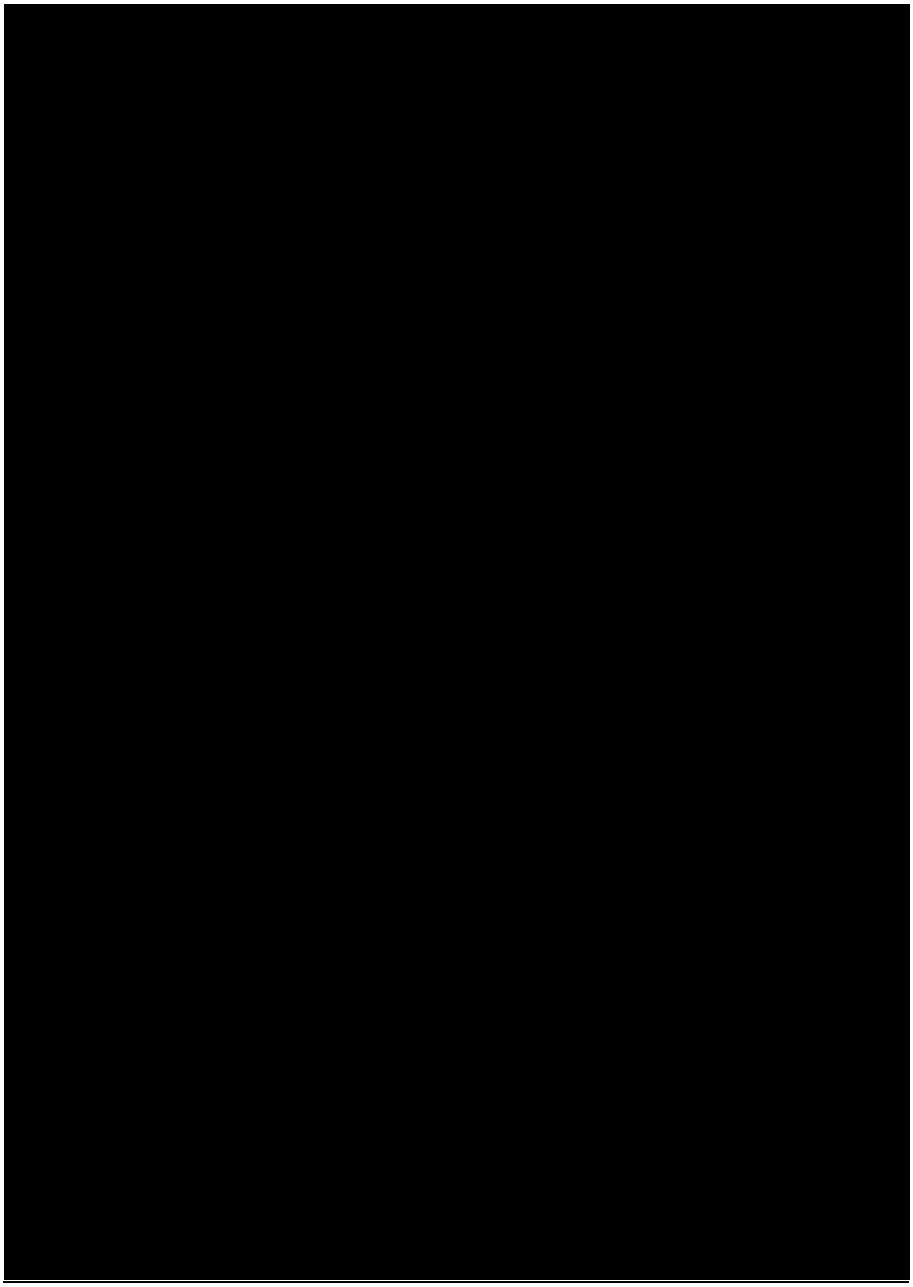
State (or Territory)	% of Consumer Expenditure	Damages
[redacted]		

State (or Territory)	% of Consumer Expenditure	Damages
[redacted]		

Source: Google App Transaction Data; Table 10.

TABLE A6.2: BY STATE COMBINED ANDROID APP DISTRIBUTION DAMAGES
(8/16/2016 – 12/31/2020)

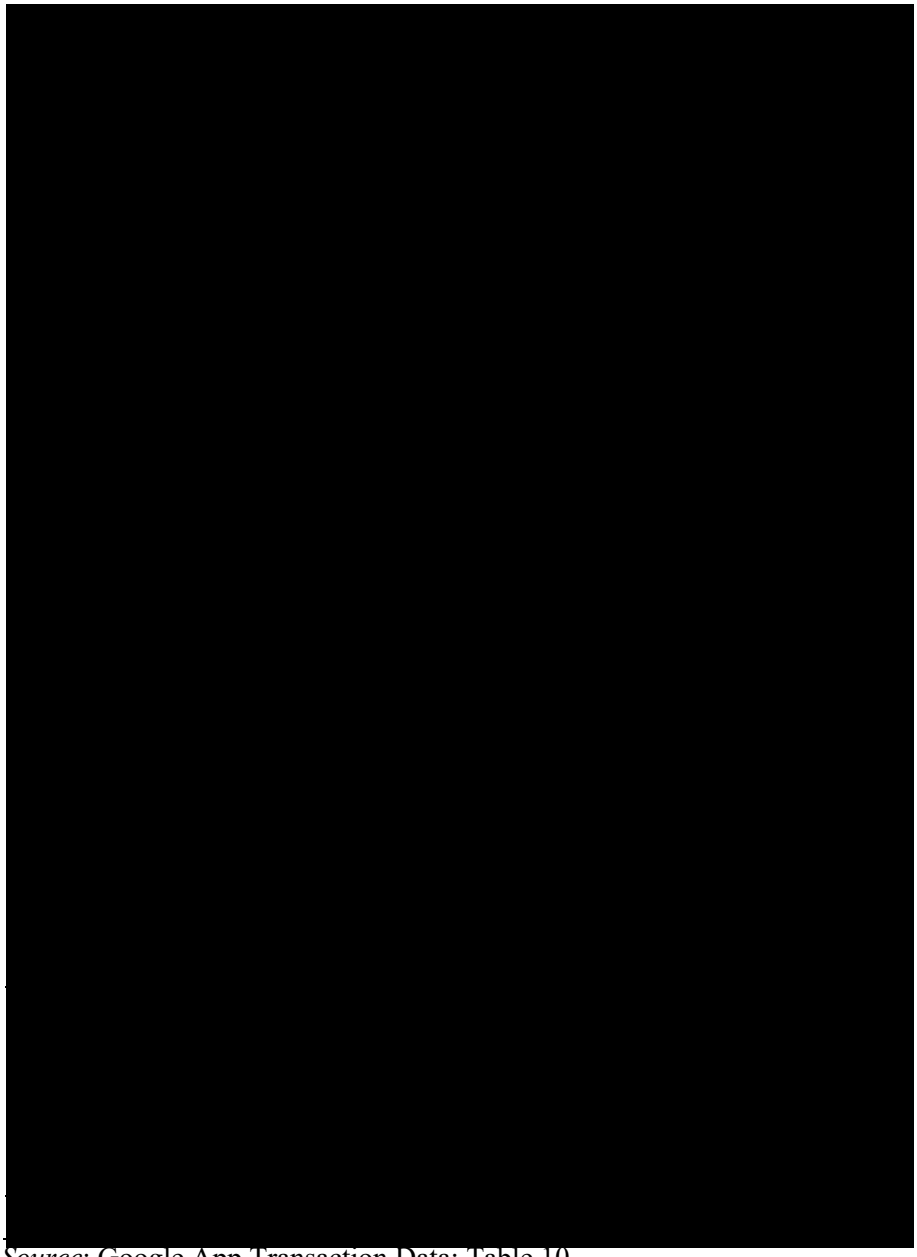
State (or Territory)	% of Consumer Expenditure	Damages
[redacted]		



Source: Google App Transaction Data; Table 10.

TABLE A6.3: BY STATE IN-APP AFTERMARKET DAMAGES (8/16/2016 – 12/31/2020)

State (or Territory)	% of Consumer Expenditure	Damages
[redacted]		



Source: Google App Transaction Data; Table 10.